2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Preface

This *2010/2011 Sacramento Valley Regional Water Management Plan Annual Update* (2010/2011 RWMP Annual Update) was prepared by the Sacramento River Settlement Contractors (SRSC) in cooperation with the U.S. Bureau of Reclamation, in accordance with the *Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors* (Regional Criteria). This 2010/2011 RWMP Annual Update is the second update to the *Sacramento Valley Regional Water Management Plan* (RWMP) that was completed in 2007. The Regional Criteria specify that beginning one year after acceptance of the RWMP, the participating SRSCs will jointly file an annual update every subsequent year to report on implementation actions taken, along with any additions and revisions to the RWMP. Accordingly, this 2010/2011 RWMP Annual Update includes updated information and status on numerous topics included as part of the RWMP.

Following are the participants in the RWMP and this 2010/2011 RWMP Annual Update:

- Anderson-Cottonwood Irrigation District
- Glenn-Colusa Irrigation District
- Provident Irrigation District
- Princeton-Codora-Glenn Irrigation District
- Reclamation District No. 108
- Reclamation District No. 1004
- Meridian Farms Water Company
- Sutter Mutual Water Company
- Natomas Central Mutual Water Company

Pelger Mutual Water Company was a participant in the RWMP but elected not to participate in this 2010/2011 RWMP Annual Update.

This 2010/2011 RWMP Annual Update summarizes activities and updates to projects and practices identified in the RWMP and focuses on the following:

- Development of individual SRSC water budgets
- Inclusion of new projects and update of proposed project status
- Review of all Quantifiable Objectives (QO) and Targeted Benefits (TB) and recommendation that all projects be designated and tracked by sub-basin
- Update of all water management practices
- Update of Sacramento Valley Water Management Coalition monitoring program
- Update of typical proposed project baseline flow approach

This document is intended to be used in conjunction with the existing RWMP (an electronic copy is provided in Appendix A to this 2010/2011 RWMP Annual Update) and the 2009 RWMP Annual Update (an electronic copy is provided in Appendix B to this 2010/2011 RWMP Annual Update). Preface Table 1 identifies all section headings included in the RWMP and indicates which subsections have been revised as part of this 2010/2011 RWMP Annual Update. A brief description of the changes made for each section is also provided. Where a revision is made to the RWMP, the revised paragraph is shaded. Relevant surrounding text is also provided, excluding tables and figures that did not require revision.

PREFACE TABLE 1
Document Organization and Description of Changes
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

RWMP Section	Information Needing to Be Updated in this 2010/2011 RWMP Annual Update?
1.0 Regional Description and Resources	Yes, see subsections below
1.1 History and Sub-basin Description	No
1.1.1 Redding Sub-basin	No
1.1.2 Colusa Sub-basin	No
1.1.3 Butte Sub-basin	No
1.1.4 Sutter Sub-basin	No
1.1.5 American Sub-basin	No
1.1.6 Colusa Drain Mutual Water Company	No
1.2 Surface Water and Groundwater Resources	No
1.2.1 Surface Water Resources	No
1.2.2 Groundwater Resources	No
1.3 Typical District Facilities	No
1.4 Topography and Soils	No
1.4.1 Topography	No
1.4.2 Soils	No
1.5 Climate	No
1.6 Natural and Cultural Resources	No
1.6.1 Natural Resources	No
1.6.2 Cultural Resources	No
1.7 Operating Rules, Regulations and Agreements that Affect Water Availability	No
1.7.1 Surface Water Resources	No
1.7.2 Groundwater Resources	No

PREFACE TABLE 1
Document Organization and Description of Changes
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

RWMP Section			Information Needing to Be Updated in this 2010/2011 RWMP Annual Update?
1.8	Water Measurement, Pricing, and Billing		Yes, see subsections below
	1.8.1	Measurement Practices	No
	1.8.2	Pricing Structures and Billing	Updated Table 1-6 with new pricing rates from each SRSC
1.9	Water Shortage Allocation Policies		No
	1.9.1	CVP Sacramento River Contract Supply Requirements	No
	1.9.2	Criteria for Defining Water Availability	No
1.10	Water Quality		No
	1.10.1	Surface Water Quality	No
	1.10.2	Groundwater Quality	No
2.0	Sub-basin Water Use, Supply, and District Descriptions		Yes, see subsections below
2.1	Redding Sub-basin		Yes, see subsections below
	2.1.1	Water Supply within the Redding Sub-basin	No
	2.1.2	Water Use within the Redding Sub-basin	No
	2.1.3	Anderson-Cottonwood Irrigation District	Provided changes to service area and distribution system, and water use
2.2	Colusa Sub-basin		Yes, see subsections below
	2.2.1	Water Supply within the Colusa Sub-basin	No
	2.2.2	Water Use within the Colusa Sub-basin	No
	2.2.3	Glenn-Colusa Irrigation District	Provided changes to water use and supply
	2.2.4	Provident Irrigation District	No
	2.2.5	Princeton-Codora-Glenn Irrigation District	No
	2.2.6	Reclamation District No. 108	Provided changes to water use and supply
2.3	Butte Sub-basin		No
	2.3.1	Water Supply within the Butte Sub-basin	No
	2.3.2	Water Use within the Butte Sub-basin	No
	2.3.3	Reclamation District No. 1004	No
2.4	Sutter Sub-basin		Yes, see subsections below
	2.4.1	Water Supply within the Sutter Sub-basin	No

PREFACE TABLE 1
Document Organization and Description of Changes
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

RWMP Section	Information Needing to Be Updated in this 2010/2011 RWMP Annual Update?
2.4.2 Water Use within the Sutter Sub-basin	No
2.4.3 Meridian Farms Water Company	Provided changes to service area and distribution system
2.4.4 Sutter Mutual Water Company	Provided changes to service area and distribution system; water use and supply; district facilities; and water measurement, pricing, and billing
2.4.5 Pelger Mutual Water Company	No
2.5 American Sub-basin	Yes, see subsections below
2.5.1 Water Supply within the American Sub-basin	No
2.5.2 Water Use within the American Sub-basin	No
2.5.3 Natomas Central Mutual Water Company	Provided changes to history, and water use and supply
2.6 Water Balance Summary	Provided water balance summary information for participating SRSCs
3.0 Regional Water Measurement Program	No
3.1 Plan Identification	No
3.2 Proposed Cooperative Water Measurement Study Measurement Plan Evaluation	No
3.3 Plan Selection	No
3.3.1 Year 1 (2006-2007) Progress Report	No
3.3.2 Year 2 (2007-2008) Progress Report	No
3.3.3 Final Report	No
4.0 Analysis of Sub-region Water Management Quantifiable Objectives	Yes, see subsections below
4.1 Development of CALFED Targeted Benefits	No
4.1.1 Purpose	No
4.1.2 Targeted Benefits and Quantifiable Objectives	No
4.1.3 Sacramento Valley Water Quality Coalition	No
4.2 Participating Sacramento River Settlement Contractor Identification of Applicable Targeted Benefits and Associated Quantifiable Objectives	No
4.2.1 Sacramento River Basinwide Water Management Plan	No

PREFACE TABLE 1
Document Organization and Description of Changes
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

RWMP Section			Information Needing to Be Updated in this 2010/2011 RWMP Annual Update?
	4.2.2	Sacramento Valley Water Management Agreement and Program	No
	4.2.3	Development of Quantifiable Objectives	Table 4-6 updated targeted benefits and proposed actions; and Table 4-7 updated targeted benefits and implemented actions; new Table 4-8 summarizes SRSCs' contribution to quantifiable objectives
	4.2.4	Redding Sub-basin	No
	4.2.5	Colusa Sub-basin	No
	4.2.6	Butte Sub-basin	No
	4.2.7	Sutter Sub-basin	No
	4.2.8	American Sub-basin	No
5.0	Identification of Actions to Implement and Achieve Proposed Quantifiable Objectives		Yes, see subsections below
5.1		Redding Sub-basin	Yes, see subsections below
5.2		ACID Churn Creek Lateral Improvements Project	Updated project schedules and budget
5.3		ACID Main Canal Modernization Project	Updated project schedules and budget
5.4		ACID Conjunctive Water Management Program	Updated project description and schedules
5.4.4		ACID Olney Creek Watershed Restoration Project	Updated project description, schedules, and budget
5.4.5		Cottonwood Creek Fish Passage Improvement and Siphon Replacement Project	Updated project description, schedules, and budget
5.4.6		System Improvement Program	Provided project description, schedules, and budget
5.5		Colusa Sub-basin	Yes, see subsections below
5.6		GCID Water Conservation and Management Project	Updated project description, schedules, and budget
5.7		GCID Conjunctive Water Management Program	Updated project description, schedules, and budget
5.8		GCID Colusa Basin Drain Regulating Reservoir Project	Updated; project description, schedules, and budget removed
5.8.4		GCID Drain Water Outflow Measurement Program	Updated project description, schedules, and budget

PREFACE TABLE 1
Document Organization and Description of Changes
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

	RWMP Section	Information Needing to Be Updated in this 2010/2011 RWMP Annual Update?
5.8.5	GCID Main Canal Milepost 35.6 Regulating Reservoir Project	Provided project description, schedules, and budget
5.8.6	RD 108 Strategic Plan for Groundwater Resources Characterization	Provided project description, schedules, and budget
5.9	RD 108 Conjunctive Water Management Program	Updated project description, schedules, and budget
5.10	RD 108 Flow Control and Measurement Project	Updated project description, schedules, and budget
5.10.4	RD 108 Northern Area Groundwater Study	Updated project schedules
5.10.5	RD 108 Recycled Water Improvement Project	Updated project description, schedules, and budget
5.10.6	RD 108 Recycled Water Management Project	Updated project description, schedules, and budget
5.10.7	RD 108 Irrigation Scheduling	Provided project description, schedules, and budget
5.10.8	RD 108 Rice Water Conservation Program	Provided project description, schedules, and budget
5.11	PCGID Conjunctive Water Management Program	Updated project description, schedules, and budget
5.12	PID Conjunctive Water Management Program	Updated project description, schedules, and budget
5.13	Butte Sub-basin	No
5.14	RD 1004 Canal Lining Project	No
5.15	RD 1004 Conjunctive Water Management Program	No
5.15.4	RD 1004 White Mallard Dam and Fish Ladder Replacement Project and Five-Points Project	Updated project schedules
5.15.5	RD 1004 Flowmeter Replacement Program	No
5.15.6	RD 1004 Recirculation Pump 8 Rebuild Project	Updated project schedules
5.15.7	RD 1004 ITRC Water Gate Project	No
5.15.8	RD 1004 10-Foot by 8-Foot Weirs Installation Project	No
5.16	Sutter Sub-basin	Yes, see subsections below
5.17	MFWC Conjunctive Water Management Program	Updated project description, schedules, and budget
5.17.4	MFWC Phase 2 Fish Screen Project	Provided project description, schedules, and budget

PREFACE TABLE 1
Document Organization and Description of Changes
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

RWMP Section			Information Needing to Be Updated in this 2010/2011 RWMP Annual Update?
	5.18	SMWC, PMWC, and RD 1500 Joint Sutter Basin Drainwater Reuse Project	Updated project description, schedules, and budget
	5.19	SMWC Canal Lining Project	Updated project schedules
	5.20	SMWC, PMWC, and RD 1500 Joint Sutter Basin Groundwater Management Program	Updated project description and schedules
	5.21	PMWC Conjunctive Water Management Program	Project description, schedules, and budget removed
	5.21.4	PMWC Canal Lining Project	Project description, schedules, and budget removed
	5.22	American Sub-basin	Yes, see subsections below
	5.23	NCMWC Conjunctive Water Management Program	No
	5.23.4	NCMWC American Basin Fish Screen and Habitat Improvement Project – Sankey Diversion	Updated project schedules and budget
	5.23.5	NCMWC SCADA Project for the Natomas Basin	No
6.0	Establishment of Monitoring Program		Yes, see subsections below
	6.1	Cooperative Study Update	Updated status of Cooperative Water Measurement Study
	6.2	Water Quality and the Sacramento Valley Water Quality Coalition	Updated status for the Sacramento Valley Water Quality Coalition monitoring program
		6.2.1 Sacramento Valley Management Plan	Updated documentation required for the Coalition
		6.2.2 Diazinon Management Plan	No
		6.2.3 Groundwater	Provided Coalition's current role in groundwater management
7.0	Proposed Budget and Allocation of Regional Costs		Updated the conservation budget on the basis of estimates of staff, time, and materials used for conservation; included estimated amount spent last year (Table 7-1) and projected budget and staff time summary for next 2 years (Table 7-2)
8.0	RWMP Coordination		Updated Table 8-1; each contractor provided a name and contact information for their "conservation coordinator" and the person responsible for coordinating and reporting on matters related to the overall RWMP
9.0	References		No

Contents

Contents, Continued

Contents, Continued

Contents, Continued

Contents, Continued

Contents, Continued

Contents, Continued

Contents, Continued

Acronyms and Abbreviations

1995 WQCP	1995 Water Quality Control Plan for the San Francisco Bay/ Sacramento-San Joaquin River Delta Estuary
AB 3030 Plan	Assembly Bill 3030 Groundwater Management Plan
AB	Assembly Bill
ac-ft	acre-feet
ac-ft/yr	acre-feet per year
ACID	Anderson-Cottonwood Irrigation District
AFSP	Anadromous Fish Screen Program
Ag WUE	Agricultural Water Use Efficiency Element
Bay-Delta	San Francisco Bay/Sacramento-San Joaquin River Delta
bgs	below ground surface
BWMP	Sacramento River Basinwide Water Management Plan
CALFED	CALFED Bay-Delta Authority
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
Coalition	Sacramento Valley Water Quality Coalition
Cooperative Study	Cooperative Water Measurement Study
CVP	Central Valley Project
Delta	Sacramento-San Joaquin River Delta
Department	California Department of Water Resources
ESA	Endangered Species Act
ET	evapotranspiration
ETo	reference evapotranspiration
GCID	Glenn-Colusa Irrigation District
ITRC	Irrigation Training and Research Center
M&I	municipal and industrial
maf	million acre-feet

MFWC	Meridian Farms Water Company
mg/L	milligrams per liter
MID	Maxwell Irrigation District
M.P.	milepost
MRPP	Monitoring and Reporting Program Plan
msl	mean sea level
N/A	not applicable
NCMWC	Natomas Central Mutual Water Company
NRCS	U.S. Department of Agriculture, Natural Resources Conservation Service
O&M	operation and maintenance
PCGID	Princeton-Codora-Glenn Irrigation District
Phase 8 Settlement	California Bay-Delta Phase 8 Settlement
PID	Provident Irrigation District
PMWC	Pelger Mutual Water Company
QO	quantifiable objective
RD	Reclamation District
Reclamation	U.S. Bureau of Reclamation
Regional Criteria	Regional Criteria for Evaluating Water Management Plans for the Sacramento River Contractors
Regional Plan	Sacramento Valley Regional Water Management Plan
SCADA	supervisory control and data acquisition
SMWC	Sutter Mutual Water Company
SRSC	Sacramento River Settlement Contractor
SVWMP	Sacramento Valley Water Management Program
SWP	State Water Project
SWRCB	State Water Resources Control Board
taf/yr	thousand acre-feet per year
TB	targeted benefit
TCCA	Tehama-Colusa Canal Authority
TIDC	Tisdale Irrigation and Drainage Company

TM	technical memorandum
TMDL	Total Maximum Daily Load
True ISM	True Irrigation Scheduling Management
USFWS	U.S. Fish and Wildlife Service
Water Board	Central Valley Regional Water Quality Control Board
WUE	Agricultural Water Use Efficiency Program

SECTION 1.0

Regional Description and Resources

Section 1.0 revisions to the RWMP are highlighted below in shaded text. An update of water pricing was completed for each SRSC.

1.1 History and Sub-basin Description

1.2 Surface Water and Groundwater Resources

1.3 Typical District Facilities

1.4 Topography and Soils

1.5 Climate

1.6 Natural and Cultural Resources

1.7 Operating Rules, Regulations, and Agreements that Affect Water Availability

1.8 Water Measurement, Pricing, and Billing

1.8.1 Measurement Practices

1.8.2 Pricing Structures and Billing

1.8.2.1 Existing Pricing Structures

1.8.2.2 Indirect Price Signals Related to Water Use

Water pricing is only one of several direct and indirect cost signals to which a grower might be subject. For a farmer who pays a flat rate, the sum of the base charge and annual irrigation charge as referenced in Tables 1-6 and Table 1-7 (2010 and 2011, respectively), for water use as an SRSC customer, may still have a monetary impact through such things as quantity and cost of fertilizers, pesticides, and herbicides. Increased water use may increase costs for these inputs. Poor water management by over irrigating may reduce yields and resulting gross revenue. If the farmer operates a private well or drain pump, the electrical power costs are a direct cost related to water use. Districts must cover operating and capital expenses with revenue from customers. Excessive irrigation results in increased pumping costs from the Sacramento River, the drain system, and wells. These costs are ultimately passed directly back to the growers, albeit at an average rate for all district customers. Many SRSC operating staff have authority to shut off delivery to a customer whose field is observed to be poorly irrigated and allowed to have excessive tailwater runoff.

TABLE 1-6
Existing SRSC Pricing Structures (2010)
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

SRSC	2010 Pricing Structure
ACID	Base charge of $75.00 per acre per year. Annual application fee of $115.00 per parcel. Irrigation delivery is on rotation basis.
GCID	Base charge of $6.00 per acre per year. Annual irrigation charge of $61.80 per acre (rice).
PID	Base charge of $2.00 per acre per year. Annual irrigation charge of $46.00 per acre (rice).
PCGID	Base charge of $10.00 per acre per year. Annual irrigation charge of $75.00 per acre (rice).
RD 108	Annual irrigation charge of $68.00 per acre for rice. $18.00 per irrigation (first of season) and $8.75 per irrigation (subsequent) for other crops.
RD 1004	Per-ac-ft charge of $9.35 per ac-ft, measured at customer turnout.
MFWC	Base charge of $22.00 per acre per year. Annual irrigation charge of $120.00 per acre (rice).
SMWC	Base charge of $25.00 to $35.00 per landowner stock acre (stock acre refers to land in the service area that is entitled to its share of available water on a mutual basis with all other such acres). Several years ago implemented a per acre per crop charge (example, $84.00 per irrigated acre for rice). Previously charged on a per ac-ft basis measured at customer turnout.
NCMWC	Base charge and administration fee on all acres of $43.85 and $26.77 plus a water toll on irrigated acres based on type of crop. Irrigation charge of $45.99 per acre (rice) and varies for other crops based on ETAW and applied water demand. Rice decomposition flooding charge is an additional $13.08 per acre.

TABLE 1-7
Existing SRSC Pricing Structures (2011)
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

SRSC	2011 Pricing Structure
ACID	Base charge of $75.00 per acre per year. Annual application fee of $115.00 per parcel. Irrigation delivery is on rotation basis.
GCID	Base charge of $6.00 per acre per year. Annual irrigation charge of $67.19 per acre (rice).
PID	Base charge of $2.00 per acre per year. Annual irrigation charge of $60.00 per acre (rice).
PCGID	Base charge of $10.00 per acre per year. Annual irrigation charge of $100.00 per acre (rice).
RD 108	Annual irrigation charge of $68.20 per acre for rice. $16.80 per irrigation (first of season) and $9.65 per irrigation (subsequent) for other crops.
RD 1004	Per-ac-ft charge of $10.35 per ac-ft, measured at customer turnout.
MFWC	Base charge of $22.00 per acre per year. Annual irrigation charge of $120.00 per acre (rice).
SMWC	Base charge of $33.00 per landowner stock acre. Several years ago implemented a per acre per crop charge (example, $87.00 per irrigated acre for rice). Previously charged on a per ac-ft basis measured at customer turnout.
NCMWC	Base charge and administration fee on all acres of $43.85 and $26.77 plus a water toll on irrigated acres based on type of crop. Irrigation charge of $45.99 per acre (rice) and varies for other crops based on ETAW and applied water demand. Rice decomposition flooding charge is an additional $13.08 per acre.

Information specific to each participating SRSC's pricing structure, including the basis of the water charges and copies of current billing forms used by each, can be found in Section 2.0.

1.9 Water Shortage Allocation Policies

1.10 Water Quality

SECTION 2.0

Sub-basin Water Use, Supply, and District Descriptions

Section 2.0 revisions to the RWMP are highlighted below in shaded text. Revisions and updates were made by each district/company.

2.1 Redding Sub-basin

2.1.1 Water Supply within the Redding Sub-basin

2.1.2 Water Use within the Redding Sub-basin

2.1.3 Anderson-Cottonwood Irrigation District

2.1.3.1 History

2.1.3.2 Service Area and Distribution System

ACID's service area encompasses approximately 32,000 acres and extends south from the City of Redding within Shasta County to northern Tehama County, encompassing the City of Anderson and the Town of Cottonwood. Although ACID overlaps the service area boundaries of these water purveyors, the District does not currently provide water for M&I uses in these communities. Approximately 90 percent of ACID's customers irrigate pasture for haying or livestock; however, some orchard and other food crops are also grown. In total, ACID's service area accounts for about two-thirds of irrigated pasture in the Redding Sub-basin.

ACID invests significant amounts of money and time each year to prevent system degradation. Some of the major work completed recently to help maintain efficient operations throughout the District are as follows:

- Underwater siphon repair on Clear Creek Siphon was completed in May 2010. ACID recently completed a feasibility study that analyzes alternatives and costs for long-term improvement and protection of the Clear Creek Siphon. Improvements are scheduled for implementation in fall 2013.
- In 2008, ACID began a System Improvement Program to replace degraded or inefficient pipelines and to pipe earthen laterals and canals that were subject to leakage. Through September 2011, implementation of this program resulted in the installation of 4,110 linear feet of pipe, varying in size from 18- to 48-inch-inside diameter.
- The Cottonwood Creek Fish Passage Improvement and Siphon Replacement Project was implemented in 2010 with partial funding and support from USFWS. Two hundred feet of 48-inch-diameter pipeline that had become exposed in the creek channel due to streambed degradation was replaced at a depth 8 feet below the streambed. The purpose of the project was to replace the damaged and leaking pipe, and re-bury the siphon to

improve fish passage; Cottonwood Creek provides critical habitat to numerous anadromous fish species.

- Two flashboard weirs were upgraded with Irrigation Training and Research Center (ITRC) at California Polytechnic State University (Cal Poly) flap gates.

2.1.3.3 Water Supply

Surface Water.

Settlement Contract Historical Diversions. Until the 1990s, ACID historically used between 121,000 to 158,100 ac-ft of their Base and Project entitlements, as shown on Figure 2-5. In recent years, ACID's ability to divert their entitlement was reduced because of fishery limitations associated with the District's operation and management of its distribution facilities. In response to a pending lawsuit by NOAA Fisheries in 1992, ACID reduced the quantity of water circulating in their delivery system. Previously, ACID had maintained higher water levels within its distribution system that corresponded to larger diversions from the Sacramento River but also maintained large return flows from the conveyance facilities back to the Sacramento River. In addition, 4 years (1977, 1991, 1992, and 1994) were classified as "critical years" and contract supplies were reduced to 75 percent or 131,250 ac-ft. During this period, ACID diverted between 96,500 and 125,800 ac-ft of their surface water entitlement. ACID, in 1999, completed the improvements to the fish ladder and screen facilities at their seasonal dam near Redding. These improvements provide greater flexibility in diverting their contract entitlements but are not expected to affect diversion quantities.

Figure 2-4 shows the historical monthly average diversions for the following five periods:

1. 1977 to 1991: Long-term period of record from beginning of recording period to just before the listing of winter-run Chinook salmon as an endangered species (also NOAA Fisheries lawsuit filed) in 1992
2. 1979 to 1982: A period of near-normal hydrologic and water use conditions
3. 1992 to 1996: The period following the listing of the winter-run Chinook salmon (also NOAA Fisheries lawsuit filed) to present
4. 1997 to 2005: The period through expiration of the original Settlement Contract
5. 2006-2010: The period to date under the renewed Settlement Contract, under which both the total contract supply and monthly diversion schedule have been revised (see Table 2-3A)

TABLE 2-3A
Diversions and Irrigated Acres – ACID 1997–2011
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Total	Irrigated Acres
1997	10,496	22,914	19,441	20,674	20,697	17,556	4,796	116,574	7,111
1998	1,309	15,020	17,885	20,200	20,365	18,322	7,569	100,670	7,118
1999	10,256	19,301	18,344	20,204	20,108	17,273	7,146	112,632	7,156

TABLE 2-3A
Diversions and Irrigated Acres – ACID 1997–2011
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Total	Irrigated Acres
2000	11,611	18,563	18,936	18,652	19,341	18,529	12,723	118,355	7,131
2001	4,760	22,530	19,767	20,512	21,702	18,657	14,124	122,052	7,060
2002	6,829	18,955	19,427	21,483	20,813	18,382	7,448	113,337	7,046
2003	6,184	14,829	19,488	18,866	18,330	17,583	12,472	107,752	6,972
2004	10,975	19,704	18,392	19,638	17,119	15,971	11,770	113,569	6,974
2005	6,166	11,356	17,219	19,337	18,857	16,265	12,818	102,018	6,779
2006	0	15,601	16,855	16,446	17,517	15,541	11,208	93,168	6,617
2007	16,613	17,692	17,677	18,228	18,203	17,768	5,722	111,903	6,644
2008	15,932	17,902	16,355	17,962	17,412	16,238	8,163	109,964	6,702
2009	14,912	17,587	15,489	17,914	17,853	16,737	6,430	106,922	6,513
2010	6,299	17,614	16,638	17,919	18,682	16,813	6,037	100,002	6,601
2011	5,447	17,107	14,635	16,671	17,014	16,132	2,808	89,814	6,604
Avg.	**8,519**	**17,778**	**17,770**	**18,980**	**18,934**	**17,184**	**8,749**	**107,915**	**6,869**
Under renewed Settlement Contract, new monthly diversion schedule:									
Project				2,000	2,000			4,000	
Base	8,000	10,000	22,000	22,000	22,000	19,000	18,000	121,000	

The following observations are noted:

- The average monthly diversions of Sacramento River water by ACID reflect the pattern of monthly quantities specified in the contract entitlements.
- With the exception of April, the average monthly diversions (1977 to 1991) are within 5,000 ac-ft of the original contract entitlement. However, diversions in April (1977 to 1991) average less than 10,000 ac-ft in comparison to the original monthly contract entitlement of 21,000 ac-ft. Diversions in the month of April are greatly affected by late-spring precipitation.
- Since 1991, total annual diversions have decreased and, thus, average diversions during each respective month have also decreased.
- Every year between 1977 and 1991, ACID had diverted some portion of their Project Supply.
- Since 1991, ACID has only diverted Project Supply during critically dry years (see also Figure 2-5). Reductions in Project Supply diversions relates to the increased cost of that associated with CVPIA Restoration Fees assessed on diverted Project Supply.

Non-contract Period (November – March).

Other Surface Water Sources.

Groundwater.

Other Water Supplies.

2.1.3.4 Water Use

District Water Requirements.

Urban. ACID's service area overlays several municipal water purveyors, many of whom are projecting increased demands to the year 2030. The Department estimates growth in the M&I sector in the vicinity of ACID to result in an increased annual water requirement of approximately 30,000 ac-ft by the year 2020, which would represent an increase of about 75 percent (Department, Northern District). A majority of the increase is assumed to be met by surface water taken from the Sacramento River**.** The District has implemented some programs and is actively negotiating others that would increase supply to these purveyors.

Examples of programs include direct supply to water treatment facilities, direct supply for municipal irrigation, provision of water for cooling buildings and industrial developments, water marketing, and assisting with the fulfillment of area of origin needs. The District has implemented the following three long-term water transfer agreements (2006, 2008, and 2009) for the provision of Project water for general municipal and industrial use:

- City of Shasta Lake: Transfer of 2,000 ac-ft/yr of Project water through 2045. This transfer has been conditionally approved by Reclamation after the determination that no more than 140 ac-ft/yr, pursuant to this project, may be diverted out of Lake Shasta except in above-normal or wet water-year types to avoid impacts to the lake's cold-water pool.
- Shasta Community Services District: Transfer of 464 ac-ft/yr of Project water through 2045. This transfer has been approved and will result in additional diversions by Shasta Community Services District from Whiskeytown Lake for general M&I purposes within its service area.
- Bella Vista Water District: Transfer of 1,536 ac-ft/yr of Project water through 2045. This transfer has been approved by Reclamation and will result in additional diversions by Bella Vista Water District at their Wintu Pumping Plant, immediately downstream from ACID's flashboard dam and screened gravity diversion on the Sacramento River.

The District is currently providing Anderson Union High School water for cooling operations, and has approved the provision of cooling water to an industrial development in Redding; this development is currently in the planning stages.

The District entered into an agreement with the City of Redding in 2011 that introduces the City of Redding as a customer of ACID for the provision of Base Supply for M&I purposes to overlapping areas within the agencies' service areas. The agreement provides for a maximum annual diversion of 4,000 ac-ft.

In addition to these realized and potential M&I demands, the District is currently participating in the Shasta County Water Resources Master Plan, which is assessing needs to the year 2030.

Environmental.

Groundwater Recharge.

Topography and Soils.

Transfers and Exchanges. ACID is one of 34 SRSCs that has participated in the Pool Program. The Pool Program was curtailed in 2009 because most SRSCs have elected to market and transfer their excess water through negotiated individual or group-based agreements.

Currently, all of ACID's Project Supply has been committed for transfer to local purveyors each year through 2045. However, due to restrictions on the transfer amount available to the City of Shasta Lake resulting from potential cold-water pool impacts, up to 1,860 ac-ft may remain available during most water-year types.

Other Uses.

2.1.3.5 District Facilities

2.1.3.6 ACID Operating Rules and Regulations

2.1.3.7 Water Measurement, Pricing, and Billing

ACID's main river diversions (Lake Redding and Churn Creek) have meters installed and operated by Reclamation, which provide both flow rate and total volume of flow. At major lateral headgates, the District measures flow rates manually using weir or gate head-flow tables. Flows at field turnouts are measured using canal headgate position tables. Drain pump flows are not metered, but the total volume pumped is estimated using power consumption and pump efficiency history. Increases in conveyance efficiency may be achieved with a program of water measurement that includes installation of intermediate measurement points along the Main Canal, improved lateral flow measurement, and installation of flowmeters and totalizers on drain pumps.

ACID does not currently meter individual customer turnouts. Estimates of flow rate are made based on canal headgate position relationships that were established by a one-time measurement of customer turnout flows using weir flow tables or a handheld propeller meter. Total deliveries per customer are not recorded. ACID's on-farm efficiency is relatively low (45 percent based on 1982 NRCS study). Field metering in combination with modifying the delivery arrangement from a rotation basis to arranged, an appropriate incentive pricing structure, and on-field improvements such as land leveling may increase the average on-farm efficiency, with some savings in water use. However, the effective implementation of such a program would depend on the correct combination of the above factors, in addition to basic economic considerations such as the return on investment to the District and landowners. Additionally, the installation, maintenance, and reading of the meters (950) would represent a major up-front capital cost to the District as well as an ongoing labor and capital expense. Table 2-7A presents an inventory of the District's water measurement devices.

TABLE 2-7A
Agricultural Measurement Device Inventory for ACID
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Measurement Type	Number	Accuracy (+/-percentage)	Reading Frequency	Calibration Frequency	Maintenance Frequency
Propeller	1	+/-2%	Daily	Yearly	Yearly
Sonic Flowmeters	1	+/-2%	Daily	Yearly	Yearly
Weirs	20	+/-10%	Weekly	N/A	Yearly
USGS Stage Recorder	1	+/-5%	Daily	Monthly	Yearly
SCADA Pressure Transducers	4	+/-1%	Twice daily	Yearly	Yearly
ITRC Mobile Weir Stick	1	+/-10%	Approximately every other month	N/A	N/A
Mobile Global Flow Probe	2	+/-5%	As needed	Yearly	Yearly
Total	**32**				

Note:
N/A = not applicable

ACID customers pay on a per-acre basis of irrigated land, and are billed upon submittal of an application for water each spring prior to the irrigation season. An administrative application fee of $115 per parcel is also imposed.

Rates from 2003 through 2008 remained unchanged at $69 per irrigated acre. In December 2008, the ACID Board of Directors approved a rate increase to $75 per acre for 2009. That rate remains in effect.

2.2 Colusa Sub-basin

2.2.1 Water Supply within the Colusa Sub-basin

2.2.2 Water Use within the Colusa Sub-basin

2.2.3 Glenn-Colusa Irrigation District

2.2.3.1 History

2.2.3.2 Service Area and Distribution System

2.2.3.3 Water Supply

Surface Water. GCID holds both pre- and post-1914 appropriative water rights to divert water from the natural flow of the Sacramento River. GCID also has adjudicated pre-1914 water rights under the Angle Decree, issued in 1930 by the Federal District Court, Northern District of California, to divert water from the natural flow of Stony Creek, a tributary to the Sacramento River. In addition, as the successor in interest to Central Canal and Irrigation Company, GCID may have, under a May 9, 1906 Act of Congress, "the right to divert, at all

seasons of the year, from the Sacramento River…an amount of water which…shall not exceed nine hundred cubic feet per second, to be used for irrigating the lands of the Sacramento Valley, on the west side of the Sacramento River" (Public Law 151, Ch. 439). These water rights are shown in Table 2-10 with associated dates and quantities.

The GCID surface water supply entitlement is currently addressed in a contract entered into with Reclamation in 1964, Contract No. 14-06-200-0855A (Contract No. 0855A). This contract provides for an agreement between GCID and the United States on the diversion of water from both the Sacramento River and Stony Creek from April 1 through October 31 of each year. This contract has been renewed and will remain in effect from April 1, 2005 through March 31, 2045.

Pursuant to provisions of the contract, Reclamation can require GCID to divert from the Sacramento River water quantities equal to and in lieu of its entitlement under the Angle Decree. Such water, along with Sacramento River water, is made available to GCID under Contract No. 0855A for diversion at its main pump station. In 1998, GCID executed a new agreement with Reclamation (Agreement No. 1425-98-FC-20-17620) for the conveyance of wildlife refuge water and other related purposes. Under the terms of this separate wheeling agreement with Reclamation, GCID can request to receive a portion of its entitlement water via two points on interconnections with the Tehama-Colusa Canal: the Cross-Tie, a 48-inch diameter pipe at Canal Mile 56, and the Inter-Tie, a 1,000-cfs flume, at Canal Mile 37. The use of the Tehama-Colusa Canal for delivery of entitlement water is subject to available capacity as determined by Reclamation, in accordance with the terms and conditions of the wheeling agreement. However, GCID has agreed to pay TCCA the O&M costs associated with wheeling a minimum of 25,000 ac-ft annually of Sacramento River water to GCID from the Tehama-Colusa Canal whether GCID uses the water or not. This water is typically acquired during rice season flood up after May 15 when the gates are put in at the Red Bluff Diversion Dam.

Contract No. 0855A provides for a maximum total of 825,000 ac-ft/yr, of which 720,000 ac-ft is considered to be Base Supply and 105,000 ac-ft is CVP water (Project Supply). The contract also provides that additional Project Supply can be purchased if surplus water is available. Water from Stony Creek and water diverted from the Sacramento River at the main pump station is accounted for as water diverted under Contract No. 0855A. For purposes of the contract, it was determined that GCID's Angle Decree rights yielded, on a long-term average, about 15,000 ac-ft/yr. This yield was included in the 720,000 ac-ft of Base Supply entitlement recognized under Contract No. 855A.

The contract specifies the total quantity of water that may be diverted each month during the period April through October each year. The monthly Base Supply ranges from a minimum of 45,000 ac-ft in October to a maximum of 150,000 ac-ft in June. CVP Supply water is available during the months of July and August, with entitlements of 55,000 and 50,000 ac-ft, respectively. The contract identifies July and August as the critical months. For the critical months, the total Base Supply is 220,000 ac-ft and the total Project Supply is 105,000 ac-ft, as shown in Table 2-11. The monthly distribution of the Base and Project Supply is shown on Figure 2-11.

Settlement Contract Historical Diversions.

Non-contract Period (November – March).

Groundwater. The GCID boundary lies within the Sacramento Groundwater Basin. The area is located on alluvium and flood basin sediments, as well as alluvial fan deposits. Flood basin sediments are deposited in low-energy environments; therefore, they typically exhibit low permeabilities. Alluvial fan sediments are deposited in higher energy, continental environments. Because they are coarser grained, alluvial fan deposits generally have high permeabilities. These recent sediments are underlain by older deposits of the Tehama and Tuscan Formations (Department, 1978).

In the northern portion of GCID, the Tehama Formation contains extensive deposits of interbedded gravel from the ancestral Stony Creek (the Stony Creek Member). The Stony Creek Member of the Tehama Formation is typically very productive, yielding large quantities of water to wells. In the south-central portion of GCID, between Willows and Williams, the Tehama Formation is predominately clayey, and wells in this area are generally less productive than those in the northern portion of GCID (Department, 1978).

The Tuscan Formation is an important water-bearing unit in the northeastern portion of the Sacramento Valley (Department, 2003a). In the Colusa Sub-basin, the Tuscan Formation interfingers with the Tehama Formation at depths of 300 to 1,000 feet bgs. Coarse-grained deposits within the Tuscan Formation can provide high well yields; however, the unit is generally too deep to be tapped by domestic and most agricultural wells west of Chico (Department, 1978).

Groundwater quality in the Sacramento Groundwater Basin is generally good and is sufficient for agricultural, domestic, and M&I uses. The total depth of freshwater aquifer in the GCID area is estimated at 900 to 1,500 feet bgs. The freshwater is underlain by saline water found in older marine units

In the northern portion of GCID, between the towns of Artois and Glenn, groundwater movement is generally to the southeast, toward the Sacramento River, at a gradient of between 4 and 15 feet per mile (Department, 2003a). In the middle of GCID, near the Town of Maxwell, the flow changes to a more easterly direction with a gradient of approximately 4 to 10 feet per mile. At the southern end of GCID, near the town of Williams, groundwater flows east to slightly northeast, toward the Sacramento River, with the gradient ranging from 7 to 10 feet per mile. The steeper gradients exist at the southwest and northwest edges of GCID. Groundwater throughout the Sacramento Groundwater Basin, and therefore within GCID, occurs in a broad alluvial basin and is therefore not confined to any well-defined subsurface stream channels.

Groundwater use within GCID is generally limited because of the availability of surface water supplies and is driven primarily by climatic conditions. GCID manages and operates a voluntary groundwater conjunctive water management program to increase capacity when water supply does not meet demand. Up to 100 landowners have participated in the groundwater program, representing a combined capacity of approximately 500 cfs. Pumping ranges from 20,000 ac-ft/year during years of high surface water supply to as much as 77,000 ac-ft in critically dry years. Seasonal fluctuations in groundwater levels are generally less than 10 feet, but can be up to 30 feet in drought years. Historical trends show

that groundwater levels in the GCID area are generally stable over the long term, although short-term fluctuations in groundwater levels are observed that can be correlated with precipitation trends. The stability of the groundwater level is due in part to GCID's average groundwater recharge of 126,000 ac-ft to the basin during the contract period (April through October). The source of this recharge is approximately 88,000 ac-ft due to deep percolation from agricultural land and 38,000 ac-ft of seepage water percolation from GCID's unlined conveyance system.

Other Water Supplies. An aggressive recapture program, which captures both subsurface flows (from system leakage and deep percolation recovered by open surface drains) and tailwater runoff from cultivated fields from within GCID's service area, is a part of GCID's overall water management program. GCID recaptures this water with both gravity and pump systems. This captured water is delivered to either laterals or the main canal for reuse. Currently, GCID recycles approximately 155,000 ac-ft annually. Relatively small quantities of tailwater are available to GCID from areas outside of the District's boundaries.

Continued reuse and recycling efforts are expected to be influenced by an increasing need to manage salinity and other constituents that affect crop productivity and sustainability. The District has established a program that encompasses the entire District to monitor soil and water salinity and test for electrical conductivity and pH.

Much of GCID's tailwater is captured for use by downstream districts such as the PID, PCGID, and MID. GCID is one of the irrigation districts that signed the Five-Party Agreement of June 2, 1956. This agreement represents a cooperative effort by GCID, PID, PCGID, MID, and two entities that have since dissolved (Compton-Delevan Irrigation District and Jacinto Irrigation District) to share O&M of the drains within their respective service areas and to share the right to recirculate the water in those drains. In addition, Colusa Basin Drain Mutual Water Company members (57,000 acres, gross) rely on tailwater from GCID and other upstream water users.

The Colusa Sub-basin irrigation systems' ability to extensively recapture and recirculate irrigation water on a inter-district basis has resulted in a basinwide traditional irrigation efficiency of over 80 percent and an "effective efficiency "of more than 91 percent (see Table A-2, Efficient Water Management for Regional Sustainability in the Sacramento Valley, prepared for NCWA by CH2M HILL, Davids Engineering, and MBK Engineers, final draft).

GCID adopted a Water Transfer Policy in 1995. This policy identifies agricultural water users within the Sacramento Valley as the highest priority, and environmental purposes as the second highest priority for future water transfers. An in-basin water transfer program was introduced in 1997 that provides for up to 20,000 ac-ft to be transferred to neighboring lands in full water supply years.

2.2.3.4 Water Use

2.2.3.5 District Facilities

Diversion Facilities.

Conveyance System. GCID has approximately 65 miles of main canal and 900 miles of laterals canals and drains. The main canal is the primary conveyance facility for the District.

The main canal generally runs along the west side of the District and supplies the various laterals for delivery to field turnouts. GCID has made many major main canal improvements during the past 10 years and will continue to modernize facilities to accommodate its canal SCADA and automation projects. These include the installation of new cross-drainage structures and the replacement of existing drainage and control structures. These improvements allow year-round operation of the main canal for supplying the wildlife refuge complex lands.

Table 2-14 summarizes GCID's main canal and the major irrigation lateral features. GCID does not currently have any lined canals. Estimation of the leakage losses from the GCID main canal indicates that losses are minimal due to the low permeability of the clay soils that are common in the area. A relatively minor quantity of water could be saved by lining some portion of the main canal, but the preliminary analysis shows this to be a prohibitively expensive water management option. Most seepage from District canals returns to surface drains adjacent to the canals, or recharges the underlying groundwater basin, making net regional water savings from canal lining minimal.

GCID has been modernizing its facilities to create a canal system with automated control and monitoring, including motor-operated radial and slide gates, water-level and flow measurement at key points in the system, and integrated SCADA to match supplies and demands throughout the system. The District also has an ongoing program to increase the coverage of the SCADA system and to automate remaining major flow control structures. Only five major control structures on the main canal require replacement and modernization. The District's operational spills are minimal based on the standard performance and requirements of an open-channel distribution systems, and it is not likely that significant reductions in the quantity of operational spills can be achieved.

TABLE 2-14
GCID Canals and Major Laterals
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Facility Name	Source Facility	Capacity (cfs)	Lined	End Spill Location	Percent Leakage Loss Estimate
GCID Main Canal	Hamilton City Pump Station	3,000	No	N/A	13
River Branch Canal (Lateral 12-4)	GCID Main Canal at MCM 12.8/12.9	100	No	Lower part of PCGID	15
Bondurant Slough (Drain A) (Laterals 17-1 and 17-2)	GCID Main Canal (48-inch Sluice Gate)	200	No	Colusa Basin Drain	12
Quint Canal (Lateral 21-2)	GCID Main Canal	140	No	Colusa Basin Drain (2047 Drain)	12
Willow Creek (Drain B)	GCID Main Canal	100	No	Quint Canal	12
Lateral 25-1	GCID Main Canal	185	No	Western Canal	12
Lateral 26-2	GCID Main Canal	130	No	Sacramento National Wildlife Refuge	10
Lateral 35-1	GCID Main Canal	30	No	Sacramento National Wildlife Refuge	10

TABLE 2-14
GCID Canals and Major Laterals
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Facility Name	Source Facility	Capacity (cfs)	Lined	End Spill Location	Percent Leakage Loss Estimate
Hunter Creek (Drain D) (aka Willits Slough)	GCID Main Canal (Sluice Gate at MCM 40.3)	100	No	Logan Creek and Colusa Basin Drain, MID	10 (clay)
Lateral 41-1	GCID Main Canal	165	No	Delevan National Wildlife Refuge, MID	10 (clay)
Stone Corral Creek (Drain E)	GCID Main Canal	100	No	Delevan, Maxwell, and Colusa Basin Drain	<10
Lateral 45-1 (Drain F3 System)	GCID Main Canal	43	No	Kuhl Weir-MID	11
Lateral 48-1 (Lurline Creek System)	GCID Main Canal	100 (Lurline Creek)	No	CDMWC and MID	12
Lateral 49-2 (Lurline Creek System)	GCID Main Canal	100 (Lurline Creek)	No	CDMWC and MID	12
Lateral 51-1 (Freshwater Creek System	GCID Main Canal	100	No	CDMWC Colusa Drain	12
Salt Creek System (including Spring Creek)	GCID Main Canal	50	No	Joins Freshwater Creek and goes into Colusa Drain (Davis Weir)	10 (can gain water)
Lateral 64-1 (at M.P. 64.95)	GCID Main Canal	150	No	Colusa National Wildlife Refuge	10
Lateral 56-1	Tehama-Colusa Canal Crosstie	130	No	Spring Creek/Salt Creek System	10

Note:
CDMWC = Colusa Drain Mutual Water Company

Storage Facilities.

Spill Recovery.

2.2.3.6 District Operating Rules and Regulations

GCID was formed under Division 11 of the California Water Code. As such, the District is subject to the rules and regulations of this code including governing its actions through an elected Board of Directors and is required to keep a minimum amount in financial reserves.

Water rotation, apportionment, and shortage allocation:

> According to GCID Water Management and Conservation Policy: *All consumer requests for water must be received at the District's office, or by the responsible water operations worker, at least three days before the water is needed by the consumer.*

According to Rule 6 of GCID Rules and Regulations: *In the event of water shortage or water delivery constraints, the District will endeavor to equitably apportion the available District water to the District land entitled thereto.*

In years in which the Board concludes that the District's water supply will be inadequate to serve all lands entitled to service from the District, the District will estimate the total water supply available for the irrigation season, and after deducting estimated canal losses, apportion the balance to each District landowner in accordance with California Water Code section 22250 and 22251. To accomplish this apportionment, the District will accept primary applications for acreages of crops for which the landowner's apportioned water share will bring appurtenant crops to maturity. All additional acreage applied for will be placed on a secondary application list. On expiration of the time to submit primary water applications, if the total estimated water required to serve the primary application is less than the total estimated water available, the excess shall be equitably allocated to secondary applications at the discretion of the Board.

Use of drainage waters:

According to Rule 7 of GCID Rules and Regulations: *District landowner(s) are advised that drain water in the District is considered water supplied by the District, and any such water recaptured by the landowner(s) or user(s) may not be used to increase irrigated acreage.*

Policies for wasteful use of water:

According to Rule 19 of GCID Rules and Regulations: *If, in the opinion of the General Manager, a consumer is wasting water, either willfully, carelessly, negligently or on account of defective private conduits, the District may refuse the delivery of water until the wasteful conditions are remedied, or the District may reduce the water inflow into the consumer's fields to a flow that would be reasonable if such wasteful conditions were remedied. Wasteful water use practices include, but are not limited to, (1) using water on roads, vacant land, or land previously irrigated, (2) flooding any portions of a consumer's land to an unreasonable depth or using an unreasonable amount of water in order to irrigate other portions of such land, (3) using water on land that has been improperly prepared for the economical use of water, and (4) allowing an unnecessary amount of water to escape from any tailgate.*

The District reserves the right to refuse delivery of water when, in the opinion of the District Manager, the proposed use, or method of use, will require excessive quantities of water which constitute waste.

2.2.3.7 Water Measurement, Pricing, and Billing

2.2.4 Provident Irrigation District

2.2.4.1 History

2.2.4.2 Service Area and Distribution System

2.2.4.3 Water Supply

2.2.4.4 Water Use

2.2.4.5 District Facilities

2.2.4.6 District Operating Rules and Regulations

2.2.4.7 Water Measurement, Pricing, and Billing

2.2.5 Princeton-Codora-Glenn Irrigation District

2.2.5.1 History

2.2.5.2 Service Area and Distribution System

2.2.5.3 Water Supply

2.2.5.4 Water Use

2.2.5.5 District Facilities

2.2.5.6 District Operating Rules and Regulations

2.2.5.7 Water Measurement, Pricing, and Billing

2.2.6 Reclamation District No. 108

2.2.6.1 History

2.2.6.2 Service Area and Distribution System

2.2.6.3 Water Supply

Surface Water.

Settlement Contract Historical Diversions.

Non-contract Period (November – March). Contract No. 0876A does not limit RD 108 from diverting water for beneficial use during the months of November through March, to the extent authorized under California law. RD 108 also has riparian water rights to the Sacramento River, which allow for diversion during the entire water year (October through September). RD 108 has historically irrigated in months prior to April (pre-irrigation), especially for tomatoes and grain crops. With the phase-out of rice straw burning over the past several years, there has been an increased interest by rice growers in fall and winter flooding of rice fields to enhance decomposition of rice straw and stubble. An average of 12,000 acres was flooded each of the past 6 years.

The District received a permit on October 30, 2010, from the SWRCB to divert up to 36,000 ac-ft of water from the Sacramento River at the Wilkins Slough Pumping Plant and the Emery Poundstone Pumping Plant during the winter months, from November 1 to February 1. The purpose of the permit is to supplement existing riparian rights for rice straw decomposition and waterfowl habitat.

Other Surface Water Sources.

Groundwater.

Other Water Supplies.

2.2.6.4 Water Use

District Water Requirements. Rice is the predominant crop grown within RD 108's service area. Other key crops include tomatoes, alfalfa, vineseed, wheat, and corn. Rice accounts for approximately 72 percent of the District's irrigated acreage on an annual basis. As is the case

with most of the other districts, water requirements are typically highest during the summer months (July and August) due to the requirements of rice and the area's hot, dry climate. Cultural practice water needs for rice are greatest early in the growing season associated with the flooding up of previously dry rice fields, as well as to meet the needs of other crops. Irrigation water requirements are met through the contract surface water supply.

Annual cropping patterns have remained fairly constant over the last few decades, other than in response to farm programs in the early 1980s. Associated water requirement needs and associated diversions have therefore been more a function of water-year type and climate than changes in cropping.

Table 2-35 shows current (1995 normalized estimates) irrigated acreage estimates for the primary crops grown within the District service area, as well as projections for 2020. The variation around these estimates (± percentage figures) was provided by the District to account for typical variations in particular crop acreage (primarily due to year type), as well as anticipated future variation.

Figure 2-26 summarizes irrigated acreage by crop, on-field water requirements, and TDRs.

With the phase-out of rice straw burning over the past several years, there has been an increased interest by rice growers in fall and winter flooding of rice fields to enhance decomposition of rice straw and stubble. An average of 12,000 acres was flooded during each of the past 6 years. This practice provides additional winter habitat for waterfowl above that which has been available within the Sacramento Valley since the development of agriculture. The District continues to work with Yolo County Resource Conservation District and Reclamation on a demonstration program of planting native vegetation along the District's irrigation and drainage canals to prevent erosion of levee slopes, to improve water quality, and to enhance wildlife habitat.

Future irrigation season cropping patterns and associated water requirements are anticipated to remain relatively the same as current conditions.

Urban.

Environmental.

Groundwater Recharge.

Topography and Soils.

Transfers and Exchanges.

Other Uses.

2.2.6.5 District Facilities

Diversion Facilities.

Conveyance System. RD 108's distribution and conveyance system includes approximately 84 miles of earthen canals and 35 miles of concrete-lined canals. The Wilkins Slough Main Canal serves laterals in the northern and western portions of the District, and is supplied from the Wilkins Slough Pumping Plant. Irrigation Canals 12, 13, and 15 serve the central portion with water from the Emery Poundstone Pumping Plant. Irrigation Canal 14 serves the western and southern boundary of the District and is supplied from the El Dorado Bend

Pump Station. Several of these canals can also be supplied by the District's drain recapture pumps, as described below. Table 2-37 summarizes RD 108's primary distribution facilities.

TABLE 2-36
RD 108 Surface Water Pumping Facilities
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Facility Name	Water Source	Pump/Gravity	Capacity (cfs)	Average Historical Diversion (ac-ft/yr)
Wilkins Slough Pumping Plant	Sacramento River	Pump/Gravity	830	95,000
Emery Poundstone Pumping Plant	Sacramento River	Pump/Gravity	300	38,900[a]
Steiner Bend – N Pump Station	Sacramento River	Pump	15	350
Steiner Bend – S Pump Station	Sacramento River	Pump	30	1,600
El Dorado Bend Pump Station	Sacramento River	Pump/Gravity	80	6,400

[a]Sum of historical diversions of the three pumping plants replaced.

TABLE 2-37
RD 108 Canals and Laterals
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Facility Name	Source Facility	Capacity (cfs)	Lined	End Spill Location	Percent Leakage Loss Estimate
Wilkins Slough Main Canal	Wilkins Slough Pumping Plant	830	Earth	None	[a]
Irrigation Canals No. 12, 13, and 15	Emery Poundstone Pumping Plant	300	Concrete	Main Drainage Canal	
Irrigation Canal No. 14	El Dorado Pumping Plant	300	Earth	Main Drainage Canal	[a]
Irrigation Canal No. 10P	Riggs Ranch Drain Pump	200	Earth	Main Drainage Canal	[a]

[a]Varies. See District deep percolation studies.

In 1997, RD 108 began upgrading and automating major supply and canal control facilities. Currently, all of the District's facilities are linked via a centralized SCADA system. The District is continuing this program with the goal of automating major canal and lateral control structures. Operational spills are currently at the lower practical amount for an open-channel irrigation system, and further significant reductions are limited. Conveyance system automation, when essentially completed over the next few years, will be fully developed as a management option for RD 108 and does not offer significant potential for new water conservation.

Storage Facilities.

Spill Recovery. RD 108 has an extensive network of drainage facilities, including over 300 miles of drains and five major drain pump stations for removal or reuse of irrigation return flows and winter stormwater runoff. Because of the topography and the surrounding

levees, drainage must be pumped out of the District. The drainage is generally conveyed to the southeast corner of the District where the Rough and Ready, El Dorado Bend, and Sycamore Slough pumping plants are used to convey the drainage either through the flood control levees and into the Sacramento River or back into the distribution laterals for reuse. Sycamore Slough lifts drainage water into Lateral 14A, which conveys water to El Dorado for removal or to the irrigation system for reuse. The Riggs Ranch Pumping Plant conveys drainage from the northern portion of the District into either the Colusa Basin Drain or back into the supply conveyance system (Irrigation Canal 10P) for reuse. The Lateral 8 Pumping Plant lifts drainage water into Wilkins Slough Main Canal for reuse. The Rough and Ready Drain Pump Station shown on Figure 2-27 is not used for irrigation. The pump discharges regional drainage into the Sacramento River when a gravity discharge is prevented by a high river stage. Tables 2-38 and 2-39 summarize the main RD 108 drainage facilities.

TABLE 2-38
RD 108 Reuse Pump Stations
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Pump Station ID	Source	Discharges To	Capacity (cfs)	Average Historical Pumping Total (ac-ft/yr)
Sycamore Slough	Main Drainage Canal	Irrigation Canal 14	220	31,000
Riggs Ranch	Drain No. 9	Irrigation Canal 10P/Colusa Basin Drainage Canal	70	9,000
Lateral 8	Drain No. 8	Wilkins Slough Main Canal	180	20,000

2.2.6.6 District Operating Rules and Regulations

2.2.6.7 Water Measurement, Pricing, and Billing

2.3 Butte Sub-basin

2.3.1 Water Supply within the Butte Sub-basin

2.3.2 Water Use within the Butte Sub-basin

2.3.3 Reclamation District No. 1004

2.3.3.1 History

2.3.3.2 Service Area and Distribution System

2.3.3.3 Water Supply

2.3.3.4 Water Use

2.3.3.5 District Facilities

2.3.3.6 District Operating Rules and Regulations

2.3.3.7 Water Measurement, Pricing, and Billing

2.4 Sutter Sub-basin

2.4.1 Water Supply within the Sutter Sub-basin

2.4.2 Water Use within the Sutter Sub-basin

2.4.3 Meridian Farms Water Company

2.4.3.1 History

2.4.3.2 Service Area and Distribution System

MFWC is located on the east side of the Sacramento River east of the community of Meridian and directly southwest of the Sutter Buttes. The Company encompasses approximately 9,900 acres and serves 73 landowners. The main pumping facility is located at River Mile 134 on the Sacramento River.

MFWC uses an arranged schedule to deliver irrigation water to Company customers. MFWC also pumps water from the Sacramento River using two other pump stations. The Company's distribution and conveyance system includes approximately 16 miles of main canals and 19 miles of major laterals. Seepage from the canals and laterals is approximately 15 percent. MFWC coordinates drain operations with RD 70, and has no specific agreements in place to handle floodwaters. MFWC has usable groundwater resources within its boundaries and uses groundwater as a normal part of its resource mix, although some nearby wells have low-quality groundwater as a result of connate water upwelling. The western edge of the Company abuts a number of independent farmers with individual contracts with Reclamation. These landowners, called "rimlanders," are not within Company boundaries, but contribute runoff that may be reused by Company farmers. Past efforts to coordinate operations with these landowners have failed.

The Company relies heavily on runoff to supplement their own water sources. The Company is able to reuse a large portion of its due to the flat physiography of the area and the use of Long Lake and several pumps that can "step" water to the upper reaches of the Company. MFWC currently uses an average of 15,000 ac-ft/yr of runoff, equivalent to approximately 60 percent of the Company's average Sacramento River diversion.

MFWC continues to aggressively maintain their system and work with farmers to maintain irrigation reliability and efficiency. In Fiscal Year 2008, MFWC worked with a farmer to help secure Pacific Gas and Electric Company grants to implement a spray emitter system for his 120 acres of walnuts that were previously flood irrigated. MFWC also concrete lined 1,180 feet of earthen canal and completed construction on a new 30-cfs diversion as part of their requirements under the 1992 CVPIA mandate. MFWC began the planning effort for this project in 2001. Construction of the Phase 1 Fish Screen Project, consisting of the New Grimes Fish Screen, Grimes Canal, and Drexler Pipeline was completed in 2009 from a combination of CALFED, through the Ecosystem Restoration Program, the Federal Anadromous Fish Screen Program (AFSP), and local funds. AFSP funding for the environmental and permitting for the Phase 2 Fish Screen Project started in fall 2011 and is expected to be released for public comment at the end of summer 2012. Construction is expected to begin in fall 2013.

2.4.3.3 Water Supply

2.4.3.4 Water Use

2.4.3.5 District Facilities

2.4.3.6 District Operating Rules and Regulations

2.4.3.7 Water Measurement, Pricing, and Billing

MFWC measures water at its three river diversion pump stations using flowmeters. Canal and lateral flow rates are measured using weir or gate head/flow curves. Wells are metered. Drain pump flows are estimated based on power consumption and pump efficiency data. Minor increases in water savings are possible through a program of improved water measurement that includes installation of intermediate measurement points along the main canals, improved lateral headgate measurement, and drain pump metering. These new measurement facilitates would be integrated with the operations automation program described above to increase overall distribution system efficiency.

MFWC does not meter individual customer turnouts. Flow rates at field turnouts are measured using head/orifice relationships. MFWC does not measure and record the total quantity of water delivered to each turnout. MFWC's on-farm efficiency is approximately 65 percent. Field metering, in combination with a modified delivery arrangement, an appropriate incentive pricing structure, and on-field improvements such as land leveling may increase the average on-farm efficiency, with minor savings in water use. The effective implementation of such a program would depend on optimal combination of the above components, in addition to basic economic considerations such as the return on investment to the Company and landowner. The installation, maintenance, and reading of the 150 meters would represent a major upfront capital cost to the Company as well as an ongoing labor and capital expense. Table 2-56A presents an inventory of the Company's water measurement devices.

TABLE 2-56A
Agricultural Measurement Device Inventory for MFWC
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Measurement Type	Number	Accuracy (+/-percentage)	Reading Frequency	Calibration Frequency	Maintenance Frequency
Propeller	5	10%	Weekly	Yearly	Yearly
Weirs	107	5%	Daily	N/A	Yearly
Total	**112**				

2.4.4 Sutter Mutual Water Company

2.4.4.1 History

2.4.4.2 Service Area and Distribution System

SMWC is located approximately 45 miles northwest of Sacramento and is bordered by three levee systems. The Company encompasses approximately 50,000 acres and serves 150 landowners. Company boundaries encompass the Town of Robbins. The Company operates four pumping plants at three locations: Tisdale Pumping Plant (960-cfs capacity), State Ranch Bend Pumping Plant (128 cfs), and Portuguese Bend Pumping Plant (106 cfs).

SMWC also has eleven booster pump sites with a total flow capacity of 229.5 cfs (they typically operate six to eleven in any given year). These facilities are used for water reuse and are located in the central and northeast portions of the Company. Additionally, SMWC uses four portable booster pumps for flexibility and maximizing its ability to recapture/ recycle drain water.

SMWC is interlaced with drainage ditches (which are operated and maintained by RD 1500) that carry water toward the Main Drain and eventually out of the service area at the southern end of the Company at the Karnak Pump Station. Drainage ditches in the eastern portion of the Company also intercept naturally occurring saline groundwater, called "connate water." This saline groundwater tends to be most prevalent toward the eastern portion of the Company associated with artesian pressure through the Sutter Basin Fault. Salinity concentrations tend to increase with depth (NRCS, 1996). Irrigation practices using Sacramento River water and drainage systems have allowed the Company and other districts/landowners to maintain suitable crop yields and keep the connate water below the crop root zones.

The western edge of the Company abuts a number of independent farmers with individual contracts with Reclamation. These landowners, called "rimlanders," are not within Company boundaries, but contribute drain water to the RD 1500 drainage system. Company operations are coordinated with RD 1500 and Pelger Mutual Water Company. RD 1500 manages drainage in the service area, and SMWC delivers water to the majority of water users in the area.

SMWC uses an arranged schedule to deliver irrigation water to Company customers. The Company's distribution and conveyance system includes approximately 56 miles of irrigation water delivery canals and 144 miles of laterals. Delivery system leakage associated with the operation of the Company is approximately 15 to 18 percent of the diversion during the spring, summer, and early fall irrigation season. Approximately 38 privately owned wells have been drilled within the Company boundaries, but most have been curtailed or abandoned due to high salinity levels and lack of sustained yield as discussed above. Reuse of water is driven in part by year type; however, the high water table and its saline nature limit the amount of water that can be successfully reused without impacting crop yields and salt accumulation in the soil profile. Winter operations call for most drains to be opened around Labor Day of each year to allow for the dewatering of the Basin in preparation for the passage of winter surface and sub-surface flows.

2.4.4.3 Water Supply

Surface Water. SMWC, formed in 1919, holds a water right to divert water from the natural flow of the Sacramento River. The SMWC surface water supply entitlement is currently addressed in a contract entered into with Reclamation in 1964, Contract No. 14-06-200-0815A (Contract No. 0815A) and re-negotiated in 2005. This contract provides for an agreement between SMWC and the United States on SMWC's diversion of available water from the Sacramento River during the period April 1 through October 31 of each year.

The renewed Contract No. 0815A provides for a maximum total of 226,000 ac-ft/yr, of which 169,500 ac-ft is considered to be Base Supply and 56,500 ac-ft is CVP water Project Supply, as shown in Table 2-59. The contract also provides that additional Project Supply can be purchased if surplus water is available.

The renewed contract specifies the total quantity of water that may be diverted by SMWC each month during the period April through October each year. The monthly distribution of the Base and Project Supply is shown on Figure 2-42. The monthly Base Supply ranges from a minimum of 5,000 ac-ft in September to a maximum of 48,000 ac-ft in May. CVP water (Project Supply) is available during the months of July, August, and September with entitlements of 25,000, 24,000, and 7,500 ac-ft, respectively. The contract identifies July, August, and September as the critical months. For the critical months, the total Base Supply is 53,500 ac-ft, and the total Project Supply is 56,500 ac-ft, as shown in Table 2-59.

Settlement Contract Historical Diversions.

Non-contract Period (November – March).

Other Surface Water Sources.

Groundwater.

Other Water Supplies. SMWC presently uses approximately 15,000 to 45,000 ac-ft/yr of drainage water from sources both inside and outside of the Company. Private landowners pump an additional 5,000 to 15,000 ac-ft from these sources. The western edge of the Company abuts a number of independent farmers with individual contracts with Reclamation. Company operations are coordinated with RD 1500 and PMWC. RD 1500 manages drainage in the service area, while SMWC delivers water to the majority of water users in the basin area.

SMWC currently operates eleven booster pumps and has dismantled one internal recirculation system (ML 10, which had three booster pump locations but is now inoperative) with a total combined capacity of 229.5 cfs. These facilities are used for reuse and are located in the central and northeast portions of the Company. Additionally, SMWC uses four portable booster pumps for flexibility and maximizing its ability to recapture/recycle drain water. SMWC is interlaced with drainage ditches that carry water towards the main drain and eventually out of the service area at the southern end of the Company. Drainage ditches in the eastern portion of the Company intercept naturally occurring saline groundwater, called "connate water." This salt-laden groundwater seeps into the drain ditches and causes an increase in salinity in the drains. Irrigation practices using Sacramento River water and drainage systems have allowed the Company and other districts/landowners to maintain suitable crop yields and keep the connate water below the crop root zones. Continued reuse and recycling efforts are expected to be influenced by an increasing need to manage salinity and other constituents that affect crop productivity and sustainability.

2.4.4.4 Water Use

Company Water Requirements. The two major crops grown within the Company's service area are tomatoes (grown in rotation with corn, wheat, safflower, and beans) and rice (sometimes grown in rotation with wheat, safflower, beans, and melons, or grown 7 or 8 years consecutively without rotation).

Rice is the predominant crop grown within SMWC's service area, accounting for in recent years approximately 60 percent of the Company's irrigated acreage on an annual basis. As is the case with most of the other districts, water requirements are typically highest during the summer months (June, July, and August) due to the requirements of rice and the area's hot,

dry climate. Cultural practice water needs for rice and other crops are greatest early in the growing season during dry years associated with irrigating previously dry fields. The vast majority of irrigation water requirements are met through the contract surface water supply, although recaptured drainwater is extensively used in recent years depending on availability and quality.

Annual cropping patterns have changed a great deal over the last few decades, as rice acreage had declined substantially in the 1990s, but in recent years rice acreage has increased noticeably with other crops leaving the area or becoming unprofitable. The prevalence of relatively rich, well-drained soils allows for a diversity of crops within the Company boundary. Tomato acreage has declined in recent years due to processors (canneries) leaving the area resulting in more acres of rice and substitute crops. Therefore, associated water requirement needs and associated diversions are driven by changes in cropping patterns, as well as water-year type.

Table 2-60 shows current (1995 normalized estimates) irrigated acreage estimates for the primary crops grown within the Company service area, as well as projections for 2020. The variation around these estimates (± percentage figures) was provided by the Company to account for typical variations in particular crop acreage (primarily due to year type), as well as anticipated future variation.

TABLE 2-60
SMWC Irrigated Acreage – 2010 and 2020 Estimates
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop	2010[a]	2020[b]
Rice	30,000 (± 10%)[c]	30,000 (± 25%)[c]
Tomatoes	3,000 (± 10%)[c]	3,500 (± 20%)[c]
Grain	8,100 (± 15%)[c]	7,100 (± 15%)[c]
Dry Beans	2,200 (± 15%)[c]	2,500 (± 15%)[c]
Other Crops	8,900 (± 15%)[c]	8,100 (± 25%)[c]
Total Irrigated Acreage	**52,200 (± 5%)[c,d]**	**52,000 (± 5%)[c,d]**

[a]Values are estimates derived from field data that have been normalized (data have been modified to simulate a condition where hydrology and climate are assumed to be normal, i.e., drought or wet condition assumed not to occur). Source: Department, Central District.

[b]Values are future projections that incorporate current and historical trends, as well as anticipated local and regional development and economic trends in the year 2020. Source: Department, Central District.

[c]Percentages obtained from SMWC.

[d]Includes 1,700 double-cropped acres for 2010, and 2,000 double-cropped acres for 2020.

Figure 2-44 summarizes irrigated acreage by crop, on-field requirements, and TDRs.

In response to increasingly stringent limitations on burning, many of the Company's landowners flood a portion of their fields to clear their land of leftover rice straw by allowing the rice stubble to decompose. Approximately 4,000 to 10,000 acres have been flooded recently, a trend that may continue or increase assuming other options (including the sale of stubble for ethanol production) are not determined to be more economically feasible. Flood-related concerns currently considered by the Company may limit the total acreage potentially flooded for rice decomposition. This practice provides additional winter

habitat for waterfowl above that which has been available within the Sacramento Valley since the development of agriculture.

Future irrigation season cropping patterns and associated water requirements are anticipated to change over time, and the total water requirements for the Company will change accordingly based primarily on the amount of rice acreage in future cropping patterns.

Urban.

Environmental.

Groundwater Recharge.

Topography and Soils.

Transfers and Exchanges. SMWC is one of 34 SRSCs that has participated in the Pool Program. The Pool Program was curtailed in 2009 because most SRSCs have elected to market and transfer their excess water through negotiated individual or group-based agreements.

Other Uses.

2.4.4.5 District Facilities

Diversion Facilities. SMWC operates four pumping plants in three locations on the Sacramento River: Tisdale Pumping Plant, State Ranch Bend Pumping Plant, and Portuguese Bend Pumping Plant. Company operations are coordinated with RD 1500 and PMWC to manage the supply and recapture/recycle system conveyance of. RD 1500 manages drainage within the SMWC service area. SMWC also supplies water to Company users in the RD 1660 area north of the Tisdale Bypass. Table 2-61 summarizes the primary SMWC surface water supply facilities. The Company does not own or operate any groundwater wells. Approximately 38 privately owned groundwater wells exist within the Company boundaries, but most have been curtailed or abandoned because of high salinity levels, lack of sustained yield, and readily available surface water supplies. See Figure 2-45 for a map of SMWC's major conveyance facilities.

Conveyance System.

Storage Facilities.

Spill Recovery. Drainage for SMWC is handled by RD 1500. The area is interlaced with drainage ditches that carry water towards the Reclamation District Main Drain and eventually out of the service area at the southern end of the Company via the RD 1500 Karnak Pumping Plant. The Company currently operates eleven active drain recapture pumps, ranging in size from 12 to 50 cfs. Additionally, SMWC uses four portable booster pumps for flexibility and maximizing its ability to recapture/recycle drain water. The Company currently recaptures and recycles between 25,000 to 60,000 ac-ft/yr with these pumps.

2.4.4.6 Company Operating Rules and Regulations

2.4.4.7 Water Measurement, Pricing, and Billing

SMWC currently measures flows at the main pump stations using flowmeters and pump flowcharts. Flows at lateral headgates are measured using headgate position. Drain lift

pump flows are measured using power consumption records and capacity information. Drainage leaving the Company is measured using a Department formula for the main drainage discharge pump station. Minor increases in conveyance efficiency could be achieved by increased operations measurement, with installation of measuring facilities along the main canal and at the heads of laterals. Any new operations measurement program should be integrated with the long-term operations automation program.

SMWC measures both the flow rate and the total quantity of water delivered at each turnout. Flow rates are measured using canal stage and turnout gate position. The volume of delivery is measured based on the flow rate and time of delivery (typically 24 hours). In the past, the Company charged for water on the basis of these measured deliveries. Beginning in 2003, the pricing policy was changed to charge users on a per-acre per specified crop basis. Although the pricing policy changed, SMWC continues to measure deliveries at each turnout. SMWC's average on-farm efficiency of approximately 63 percent could potentially be increased through a combination of incentive pricing and on-farm improvements, providing some conservation savings. SMWC has participated in a water measurement study with other SRSCs to compare sub-basin and lateral level measurement to on-farm measurement. Table 2-62A presents an inventory of the Company's water measurement devices.

TABLE 2-62A
Agricultural Measurement Device Inventory for SMWC
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Measurement Type	Number	Accuracy (+/-percentage)	Reading Frequency	Calibration Frequency	Maintenance Frequency
Concrete Large Weirs	15	+/-6-10%	Daily	N/A	Yearly if needed
Measured Gates	357	+/-6-10%	Daily	Yearly or as frequently as needed	Yearly if needed
Measured Risers	14	+/-6-10%	Daily	Yearly or as frequently as needed	Yearly or as frequently as needed
Measured Checks	95	+/-6-10%	Daily	Yearly or as frequently as needed	Yearly or as frequently as needed
Total	**481**				

The intent is to demonstrate whether water purveyors need to measure water conveyance down to the on-farm level to accurately measure Company flows and deliveries. Preliminary indications are that sub-basin and lateral measurement is adequate for Company measurement and monitoring.

2.4.5 Pelger Mutual Water Company

2.4.5.1 History

2.4.5.2 Service Area and Distribution System

2.4.5.3 Water Supply

2.4.5.4 Water Use.

2.4.5.5 District Facilities.

2.4.5.6 District Operating Rules and Regulations

2.4.5.7 Water Measurement, Pricing, and Billing

2.5 American Sub-basin

2.5.1 Water Supply within the American Sub-basin

2.5.2 Water Use within the American Sub-basin

2.5.3 Natomas Central Mutual Water Company

2.5.3.1 History

NCMWC (or the Company) was organized under the California Irrigation District Act of 1897. The Company entered into a negotiated agreement with Reclamation in 1964, quantifying the amount of water it would divert from the Sacramento River. The resulting negotiated agreement recognized NCMWC's annual entitlement to a Base Supply of 98,200 ac-ft/yr of flows from the Sacramento River and also provided for a 22,000 ac-ft allocation of Project Supply, resulting in a total contract entitlement of 120,200 ac-ft/yr. The schedule of monthly diversions of the Contract Total, Base Supply, and Project Supply are identified in Exhibit A to the Settlement Contract for NCMWC, and is included in Table 2-72. The Settlement Contract negotiated in 1964 was renewed in May 2005, and run until March 2045.

In addition to the contract water, NCMWC has entitlements to divert Sacramento River water during the nonirrigation season for wetlands and rice straw decomposition. There are approximately 61 privately owned wells and two NCMWC-owned wells within its boundaries. These wells are used in conjunction with the river pumps and recycling pump to meet irrigation needs on an as-needed basis. Rice is the predominant crop grown within the Company boundaries, in addition to sugar beets and grain.

2.5.3.2 Service Area and Distribution System

2.5.3.3 Water Supply

Surface Water. The NCMWC surface water supply entitlement is currently addressed in a contract with Reclamation entered into in 2005, Contract No. 14-16-200-0885A-R-1 (Contract No. 0885A-R-1). This contract provides for an agreement between NCMWC and the United States on NCMWC's diversion of water from the Sacramento River during the period April 1 through October 31 of each year.

Contract No. 0885A-R-1 provides for a maximum total of 120,200 ac-ft/yr, of which 98,200 ac-ft is considered to be Base Supply and 22,000 ac-ft is CVP water (Project Supply),

as shown in Table 2-74. The contract also provides that additional Project Supply can be purchased if surplus water is available.

Settlement Contract Historical Diversions.

Non-contract Period (November – March).

Other Surface Water Sources.

Groundwater.

Other Water Supplies. In recent years, NCMWC has relied heavily upon recycled water as an alternate supply to its Sacramento River entitlement. The source of this recycled water has been primarily from inside of the Company, although some recycled water is available from the lands on the western edge of the Company which are adjacent to the Sacramento River (approximately 7,000 acres). High groundwater levels in much of the Company service area also contribute inflow to the drains. Approximately 35,000 ac-ft of recycled water are used annually. Continued reuse and recycling efforts are expected to be influenced by an increasing need to manage salinity, pH, and other constituents that affect crop productivity and sustainability.

The Company completed the installation of a recirculation system in 1986, to improve water quality for the City of Sacramento and increase overall efficiency within the Company boundaries. The recirculation system has since provided for the following benefits:

- Improve water quality discharge from RD 1000 pumping plants into the Sacramento River.
- Reduce pumping during the summer months by RD 1000, thus reducing their operation costs.
- Increase water availability to parts of service area with a history of "poor service."
- Reduce costs to customers (drain rate) who install drain pumps to receive tailwater exclusively.
- Reduce diversions and water costs paid (Restoration Fund) for Project Supply.
- Improve water conservation practices through the installation and operation of a Companywide recycling program.
- Allow greater flexibility for growers in method and timing of water application and crop selection without the implementation of a metered water charge system.

The recirculation system includes 30 pumping stations at various locations that recapture water for reuse either directly into fields or back into the main irrigation canals. During a normal irrigation season, no agricultural drainage water returns to the Sacramento River until after the end of the rice irrigation season (between August 15 and September 1).

2.5.3.4 Water Use

District Water Requirements. Rice is the overwhelmingly predominant crop grown within NCMWC's service area. Other crops include alfalfa and truck farming along with rotation crops such as wheat, sunflower and safflower, which are rotated with rice. Rice typically

accounts for approximately 70 to 75 percent of the Company's irrigated acreage on an annual basis. Agriculture in NCMWC is under increasing pressure to convert to urbanized, residential use in the face of growth in the greater Sacramento region. Additionally, some of the urban developments, such as the airport, use Company water for ornamental landscaping, truck gardens, and fruit stands.

As is the case with most of the other water providers, water requirements are typically highest during the spring and summer months (May, June, July, and August) due to the requirements of rice and the area's hot, dry climate. Cultural practice water needs for rice are greatest early in the growing season associated with the flooding up of previously dry rice fields, as well as to meet the needs of other crops. The vast majority of irrigation water requirements are met through the contract surface water supply, although groundwater is used in drought years on an individual grower basis, as well as per agreements with the Company. Annual cropping patterns have remained fairly constant over the last few decades, other than in response to farm programs in the early 1980s. Associated water requirement needs and associated diversions have therefore been more a function of water-year type and climate than changes in cropping.

Table 2-75 shows current (1995 normalized estimates) irrigated acreage estimates for the primary crops grown within the Company service area, as well as projections for 2020. The variation around these estimates (± percentage figures) was provided by the Company to account for typical variations in particular crop acreage (primarily due to year type), as well as anticipated future variation.

Figure 2-55 summarizes irrigated acreage by crop, on-field water requirements, and TDRs.

In response to increasingly stringent limitations on burning, some of the Company's rice-growing landowners flood a portion of their fields to clear their land of leftover rice straw by allowing the rice stubble to decompose. Approximately 5,780 acres were flooded in 1999 and 6,700 acres were flooded in 2004, a trend that is expected to continue or increase, assuming other options (including the sale of stubble for ethanol production) are not determined to be more economically feasible. This practice provides additional winter habitat for waterfowl above that which has been available within the Sacramento Valley since the development of agriculture.

Urban.

Environmental. Company lands are currently not all included in the Natomas Basin Habitat Conservation Plan that has been prepared to address long-term habitat needs for the giant garter snake, the American peregrine falcon, the valley elderberry longhorn beetle, and multiple other state- and federal-listed or threatened species. The preparation of the Natomas Basin Habitat Conservation Plan underscores the continuing resource agency concern with the continued urban development of lands within the NCMWC service area, which currently provide valuable habitat for a number of sensitive species. Adoption and implementation of this habitat conservation plan has placed additional constraints on both agricultural and M&I water use, including deliveries of water in the winter and cropping requirements. However, implementation of the Natomas Basin Habitat Conservation Plan is expected to limit the amount of additional Company lands that could be converted to urban use.

Approximately 635 acres of riparian vegetation are estimated to be incidentally supplied by irrigation, including vegetation directly adjacent to delivery laterals or influenced by leakage from the delivery system. Such vegetation includes habitat used by the federally listed giant garter snake and other species that use such habitat as discussed above.

Up to 6,700 acres of rice stubble were flooded in 2004, with associated winter habitat benefits to migratory waterfowl that use the area as part of the Pacific Flyway. The flooding of rice fields in the spring and summer provides wetlands habitat during these periods for waterfowl and terrestrial species. Rice fields that are not flooded also provide habitat for waterfowl and upland birds as resting areas. Of these lands, the Natomas Basin Conservancy manages approximately 1,031 acres of environmental or wetlands areas within the Company. By 2020 is anticipated that NCMWC will have 2,500 acres of managed marsh/wetlands, and an additional 4,500 acres of agricultural land owned and operated by the Natomas Basin Conservancy.

Groundwater Recharge.

Topography and Soils.

Transfers and Exchanges.

Other Uses.

2.5.3.5 District Facilities

Diversion Facilities. NCMWC has three main pump stations located on the Sacramento River: Prichard Lake Pumping Plant, Riverside Pumping Plant, and Elkhorn Pumping Plant. NCMWC also diverts water from the Cross Canal at the Northern and Bennett Pumping Plants. The Cross Canal is located along the northern boundary of the service area. Diversions from the Cross Canal generally flow from north to south; water diverted from the Sacramento River generally flows east or south. Table 2-76 summarizes these surface water supply facilities. A separate 75-cfs capacity pump at the Elkhorn Pumping Plant supplies landscape irrigation water for the Sacramento Metropolitan Airport. See Figure 2-56 for a map of NCMWC's major conveyance facilities.

The Company owns groundwater wells, which are rarely used for water supply.

TABLE 2-76
NCMWC Surface Water Supply Facilities
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Facility Name	Water Source	Pump/Gravity	Capacity (cfs)	Average Historical Diversion (ac-ft/yr)
Northern Main Pumping Plant	Cross Canal	Pump	220	37,000
Prichard Lake Pumping Plant	Sacramento River	Pump	150	10,000
Elkhorn Pumping Plant	Sacramento River	Pump	90	10,500
Bennett Pumping Plant	Cross Canal	Pump	160	15,200
Riverside Pumping Plant	Sacramento River	Pump	50	7,000

Conveyance System. NCMWC's distribution and conveyance system includes approximately 260 miles of canals and laterals. Two main canals, the Northern Main Canal and the Bennett Main Canal, serve the northern and eastern portion of the Company service area with water from the Northern Main Pumping Plant. The Central Main Canal, the Garden Highway Canals, and their associated laterals serve the central and southern portions of the service area. Table 2-77 summarizes the main distribution facilities.

TABLE 2-77
NCMWC Canals and Laterals
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Facility Name	Source Facility	Capacity (cfs)	Lined	End Spill Location	Percent Leakage Loss Estimate
Bennett Main Canal	Bennett Pumping Plant (Cross Canal)	90	No	Sankey Road Ditch	12
Central Main Canal	Prichard Lake Pumping Plant	130	No	Plant 8 Pumps	12
Northern Main Canal	Northern Pumping Plant (cross canal)	120	No	Swimming Hole Diversion	12
Chappel Main Canal	Northern Main Pumping Plant	50	No	None	12
East Drain	East Drain Pumps	20	No	None	12
Garden Highway North	Drain Pump No. 3	20	Yes	None	12
Garden Highway South	Riverside Pumping Plant	37	Yes	None	12
Elkhorn Canal	Elkhorn Pumping Plant	45	Yes	West Drain	10
Reservoir Road	Elkhorn Pumping Plant	45	Yes	Airport Drain	10
Pullman	Pullman Pumps	150	No	No. 3	12
No. 3	Pullman	60	No	Lateral 3C	12
No. 8	Central Main Canal	100	No	Sills Lateral	12
No. 13	Plant No. 13 Pumps	20	No	State Check Ditch	15

Storage Facilities.

Spill Recovery. NCMWC is drained by four main drainage canals: Natomas East Main Drainage, North Drainage, East Drainage, and West Drainage Canals. The Natomas East Main Drainage Canal drains directly into the Sacramento River, just north of its confluence with the American River. The West Drainage Canal and the East Drainage Canal join in the south and drain to the Sacramento River in the southern portion of the Company via a drain pump. In addition, the Company completed the installation of a recirculation system in 1986 to increase water quality for the City of Sacramento and increase overall efficiency of the Company. The recirculation system includes 30 pumping stations at various locations that recapture for use either directly onto fields or back into the main irrigation canals.
Tables 2-78 and 2-79 summarize the main NCMWC drainage facilities.

TABLE 2-78
NCMWC Drain Pump Stations
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Pump Station ID	Source	Discharges To	Capacity (cfs)	Average Historical Pumping Total (ac-ft/yr)
San Juan Pump	San Juan Ditch	San Juan Lateral	14	1,300
Plant No. 13 Pumps	West Drainage Canal	No. 13	20	200
Plant No. 8 Pumps	E Drainage Canal	H Road Lateral	75	4,200
E Drain Pumps	East Drainage Canal	E Drainage Canal	37	2,400
T-Drain Pump	T-Drain	Northern Main	18	4,300

TABLE 2-79
NCMWC Drainage Laterals
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Name	End Spill	Downstream Diverters/Recapture
T-Drain	Northern Main Canal	NA
North Drainage Canal	H1/Pullman Pumps	NA
E Drainage Canal	Natomas E Main Drainage Canal	NA
Airport Drain	West Drainage Canal	NA
West Drainage Canal	Fisherman's Lake/Natomas Main Drainage	NA
Fisherman's Lake	West Drainage Canal	NA
San Juan 30 Horse Ditch	West Drainage Canal	NA
Natomas E Main Drainage Canal	RD 1000 Pumping Plant	NA

Note:
NA = not available

During the growing season, drains are managed by NCMWC to deliver water. RD 1000 manages the drains in the off season (after October 1), when most drainage is returned to the Sacramento River.

2.5.3.6 District Operating Rules and Regulations

2.5.3.7 Water Measurement, Pricing, and Billing

2.6 Water Balance Summary

Water balance summaries were developed for each participating SRSC and are included in Appendix C for the 2010 and 2011 irrigation year. These summaries are based on the Agricultural Water Inventory Tables ("Standard Tables") contained in the Water Management Planner developed by Reclamation to meet the 2011 Standard Criteria for Agricultural and Urban Water Management Plans. The tables from the Water Management

Planner were modified to display and identify information unique to the SRSCs, including rice production. The summaries are limited to the April through October period covered by the SRSC contracts.

Surface water supplies are based on records of the SRSC diversions from Reclamation's monthly water accounting and the SRSC's records. District groundwater pumping is based on SRSC records. Private groundwater pumping is estimated by the SRSCs.

Precipitation data are based on the average monthly precipitation reported by California Irrigation Management Information System (CIMIS) for the Nicolaus, Davis, and Colusa stations for the Sacramento Valley and for the Gerber CIMIS station for the Redding Sub-basin.

Crop evapotranspiration tables were prepared using crop coefficients (Kc values) developed from the January 2003 report California Crop and Soil Evapotranspiration, ITRC Report 03-001, prepared by the Irrigation Training and Research Center at Cal Poly San Luis Obispo and monthly 2010 and 2011 reference ET (ETo) from CIMIS. For the SRSC's in the Sacramento Valley Kc values were developed using the Zone 12 data from the ITRC Report and the average 2010 and 2011 ETo reported by CIMIS at its Nicolaus and Davis stations. The crop evapotranspiration for the Redding Sub-basin are based on the Zone 14 data from the ITRC Report and 2010 and 2011 ETo data reported for the Gerber CIMIS station. Evaporation for use in estimating distribution system evaporation and seepage is estimated at 1.1 times the monthly ETo. Effective precipitation is estimated at 60 percent of the irrigation season precipitation.

Leaching requirements were developed using the methods and equations described by R.S. Ayers and D.W. Westcot published in FAO Irrigation and Drain Paper 29, Rev. 1. As identified in the footnotes to Table 5 of the water balances, the crop consumptive use values do not include water required for initial flooding, re-flooding, or flow-through on rice acres.

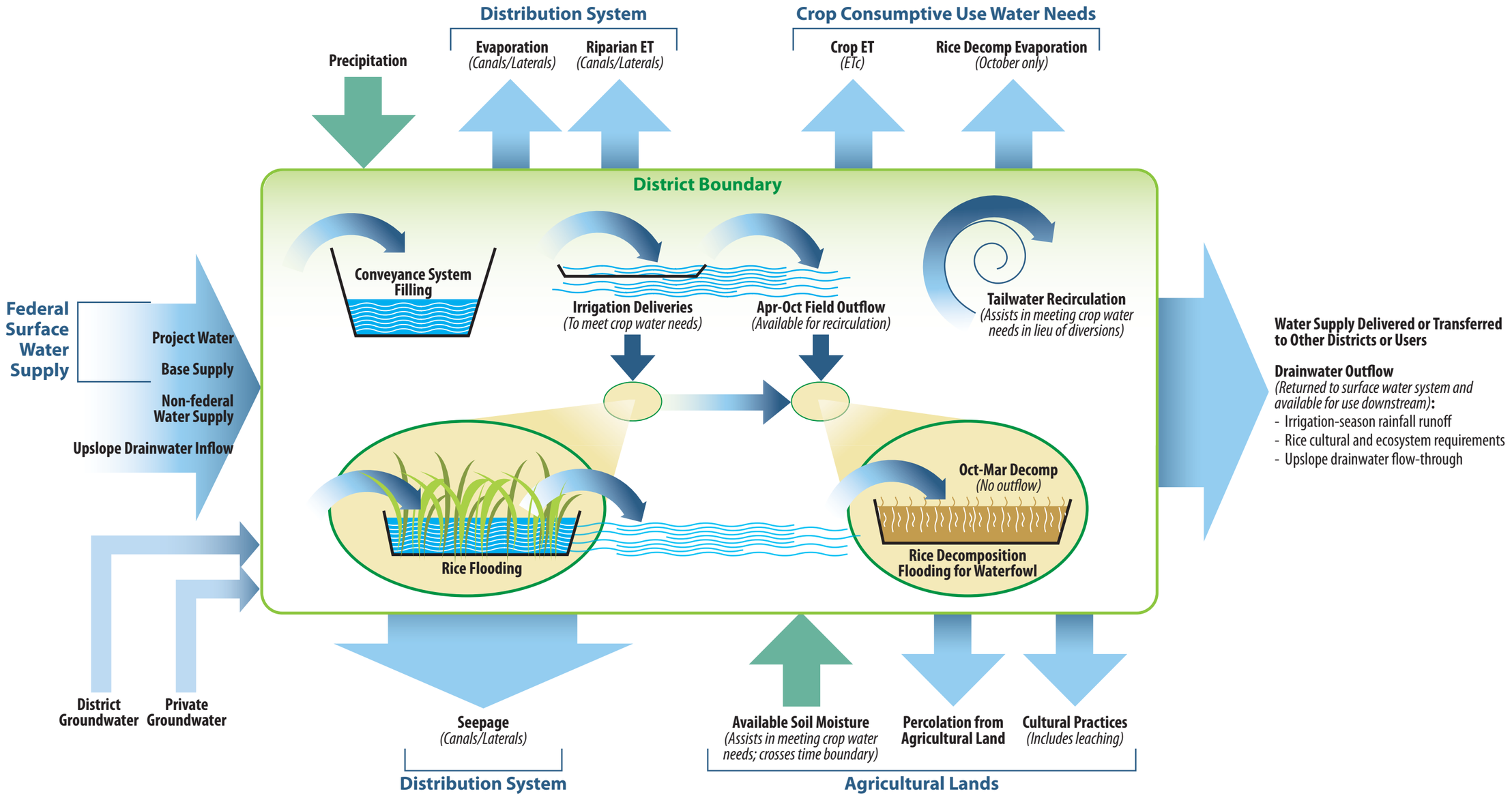
It should be recognized that these source data were considered the most accurate and current information available at the district level for the 2010 and 2011 irrigation year. Information provided in the original BWMP was developed by and obtained from the Department for a normalized 1995 cropping pattern for a projected normal and drought condition. The unit ET of applied water assumed for each district in the BWMP compares favorably with the ITRC and CIMIS assumptions and data used to develop the balance summaries for the 2010 and 2011 irrigation year.

Table 6 of the water balances summarizes the inflows and outflows from the individual SRSC's, including an estimate of available soil moisture, inflow from precipitation, and evapotranspiration precipitation by crops. Figure 2-57 summarizes the SRSC water balances. The various sources of the district outflows have been estimated by the SRSC's. The sub-total without recirculation was utilized as a closure term. Positive values indicate unaccounted for losses such as percolation to groundwater. Negative values may indicate losses such as seepage into the water balance boundaries from high water tables. Table 6 also shows the quantities of water recaptured and recirculated for reuse within the SRSC's service areas.

In addition to the individual water balance tables, a regional-level summary of SRSC diversion and return flows for the 2010 and 2011 irrigation year was prepared. Figures 2-58

and 2-59 (2010 and 2011, respectively) are schematics that illustrate the relationships between participating SRSC's, and shows diversions from and return flows attributable to the participating SRSCs to and from the Sacramento River. Return flows to the river are available for a variety of uses including re-diversion and/or environmental benefits. The regional-level summary of SRSC diversion and return flows also identifies the average diversion and average consumptive use per cropped acre for the 2010 and 2011 irrigation year within the participating SRSC service areas.

This page intentionally left blank.



Note: All district inflows and outflows except for rice decomp evaporation are April through October. Rice decomp evaporation is October only.

FIGURE 2-57
SCHEMATICS OF DISTRICT WATER BALANCE
2010/2011 SACRAMENTO VALLEY REGIONAL WATER MANAGEMENT PLAN ANNUAL UPDATE

SUMMARY

SRSC 2010 Diversions* =	1,336,508 AF
SRSC 2010 Return Flows (available for use downstream)* =	429,006 AF
Total 2010 Recirculation/Reuse by SRSCs =	421,552 AF

SUMMARY (Cont.)

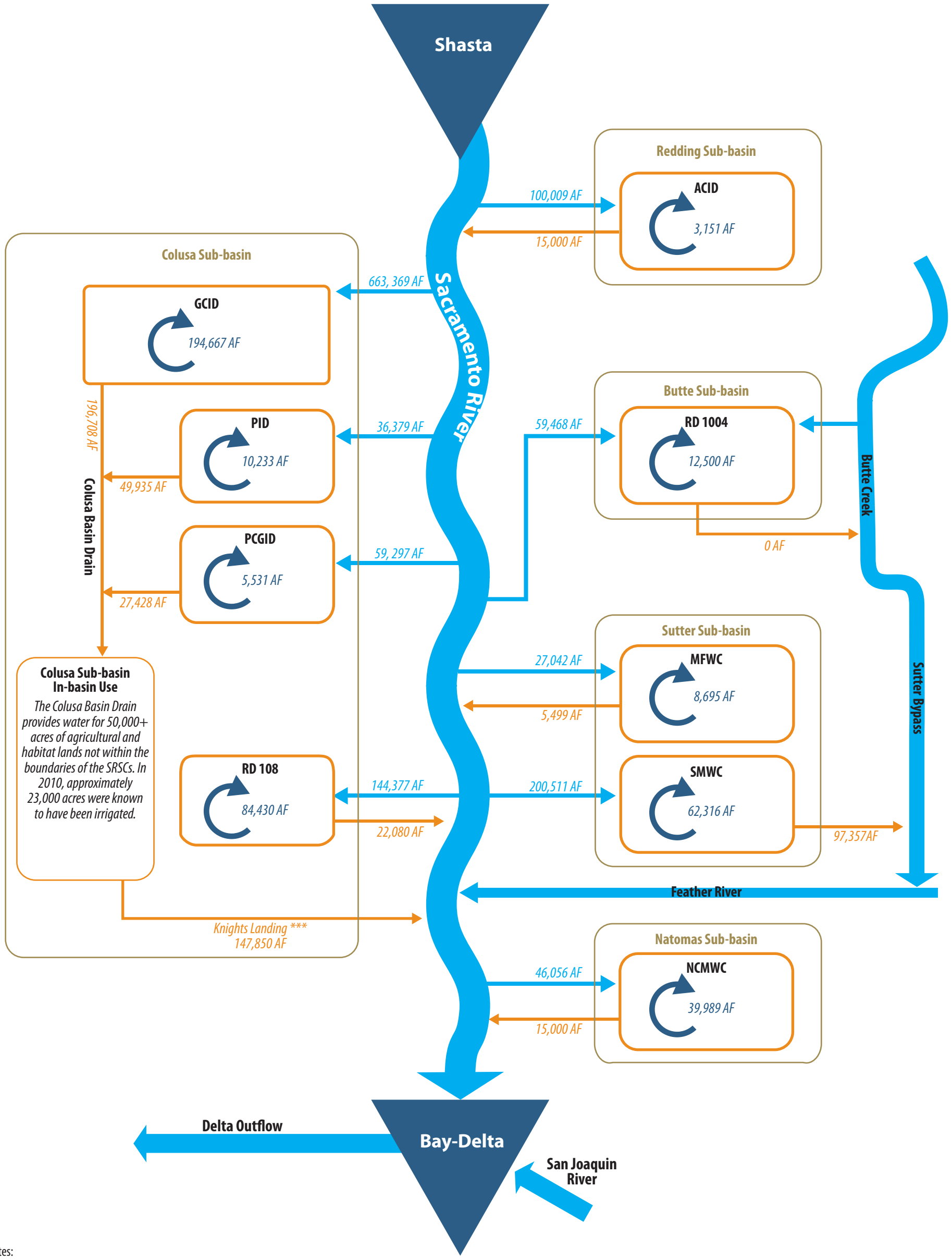
Total Cropped Acres for 2010** =	344,020 AC
Average Diversion for 2010 = (SRSC Diversion ÷ Total Cropped Acres)	3.88 AF/AC
Average Consumptive Use for 2010 = ((SRSC Diversion-SRSC Return Flow) ÷ Total Cropped Acres)	2.64 AF/AC

LEGEND

DIVERSIONS

RETURN FLOW

Total Recirculated for Reuse



Notes:

* Diversions and return flows are from 2010 SRSC water balance tables.

** Total cropped acres for 2010 includes 23,000 acres within the Colusa Sub-basin that rely on return flows from the SRSCs for surface water supplies.

***Return to river at Knights Landing is based on data obtained from the Department's Water Data Library.

AC = acre

AF = acre-feet

FIGURE 2-58
SCHEMATICS AND SUMMARY OF 2010 SRSC DIVERSIONS AND RETURN FLOWS

SUMMARY

SRSC 2011 Diversions* =	1,298,598 AF
SRSC 2011 Return Flows (available for use downstream)* =	513,475 AF
Total 2011 Recirculation/Reuse by SRSCs =	397,838 AF

SUMMARY (Cont.)

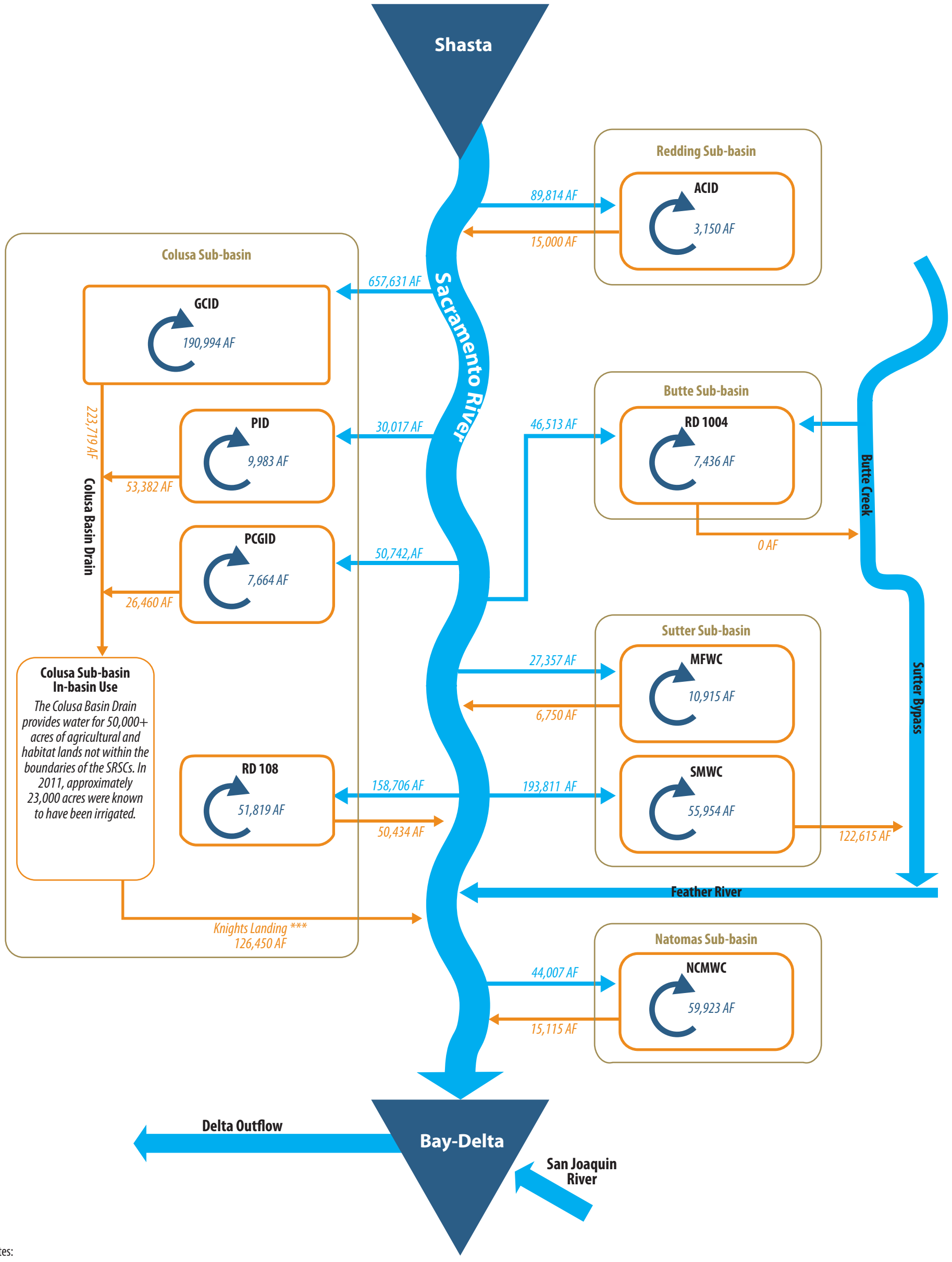
Total Cropped Acres for 2011** =	342,037 AC
Average Diversion for 2011 = (SRSC Diversion ÷ Total Cropped Acres)	3.80 AF/AC
Average Consumptive Use for 2011 = ((SRSC Diversion-SRSC Return Flow) ÷ Total Cropped Acres)	2.30 AF/AC

LEGEND

DIVERSIONS

RETURN FLOW

Total Recirculated for Reuse



Notes:

* Diversions and return flows are from 2011 SRSC water balance tables.

** Total cropped acres for 2011 includes 23,000 acres within the Colusa Sub-basin that rely on return flows from the SRSCs for surface water supplies.

***Return to river at Knights Landing is based on data obtained from the Department's Water Data Library. No data are available for May, June, and October.

AC = acre

AF = acre-feet

FIGURE 2-59
SCHEMATICS AND SUMMARY OF 2011 SRSC DIVERSIONS AND RETURN FLOWS

2010/2011 SACRAMENTO VALLEY REGIONAL WATER MANAGEMENT PLAN ANNUAL UPDATE

SECTION 3.0

Regional Water Measurement Program

No changes were made.

3.1 Plan Identification

3.2 Cooperative Water Measurement Study Measurement Plan Evaluation

3.3 Plan Selection

3.3.1 Year 1 (2006) Progress Report

3.3.2 Final Report

3.3.3 Cooperative Study Conclusions Overview

SECTION 4.0

Analysis of Sub-region Water Management Quantifiable Objectives

Section 4.0 revisions to the RWMP are highlighted below in shaded text. A re-evaluation of TBs applicable to each SRSC and identification/summary of all actions to meet QOs for each applicable TB were completed.

The method used to number and identify proposed projects has been revised to better reference the sub-basin within which a particular project is proposed. The SRSCs have determined that this system is more appropriate given the reuse of water at the sub-basin level to identify and describe TBs rather than the CALFED numbers used in previous updates.

Tables 4-1, 4-2, 4-3, 4-4, and 4-5 (located at the end of this section) list the new RWMP sub-basin number for each sub-basin with the original CALFED number and the corresponding targeted benefit.

The list of TBs, proposed actions, and quantifiable objectives presented in Table 4-6 (located at the end of this section) includes all projects currently identified to date within each sub-basin by individual SRSCs. A list of implemented actions, formerly listed as proposed actions in Table 4-6, and associated TBs and quantifiable objectives are presented in Table 4-7 (located at the end of this section). In some instances, a proposed action listed in Table 4-6 is undergoing a phased implementation approach and the entire action is yet to be completed. Hence, only the implemented action is listed in Table 4-7. A comparison of the target QO amount with actions proposed and implemented by the SRSCs is shown in Table 4-8.

4.1 Development of CALFED Targeted Benefits

4.2 Participating Sacramento River Settlement Contractor Identification of Applicable Targeted Benefits and Associated Quantifiable Objectives

4.2.1 Sacramento River Basinwide Water Management Plan

4.2.2 Sacramento Valley Water Management Agreement and Program

4.2.3 Development of Quantifiable Objectives

4.2.4 Redding Sub-basin

4.2.4.1 Identification of Applicable Targeted Benefits

4.2.4.2 Determination of Non-applicability

Anderson-Cottonwood Irrigation District.

4.2.5 Colusa Sub-basin

4.2.5.1 Identification of Applicable Targeted Benefits

4.2.5.2 Determination of Non-applicability

Glenn-Colusa Irrigation District.

Princeton-Codora-Glenn Irrigation District.

Provident Irrigation District.

Reclamation District No. 108.

4.2.6 Butte Sub-basin

4.2.6.1 Identification of Applicable Targeted Benefits

4.2.6.2 Determination of Non-applicability

Reclamation District No. 1004.

4.2.7 Sutter Sub-basin

4.2.7.1 Identification of Applicable Targeted Benefits

4.2.7.2 Determination of Non-applicability

Sutter Mutual Water Company.

Pelger Mutual Water Company.

Meridian Farms Water Company.

4.2.8 American Sub-basin

4.2.8.1 Identification of Applicable Targeted Benefits

4.2.8.2 Determination of Non-applicability

Natomas Central Mutual Water Company.

TABLE 4-1
Targeted Benefits in Redding Sub-basin
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

CALFED Number	RWMP Sub-basin Number	Targeted Benefit
4	R-1	Provide flow to improve aquatic ecosystem conditions in Cottonwood Creek
6	R-2	Provide flow to improve aquatic ecosystem conditions in the Sacramento River below Keswick
7	R-3	Decrease nonproductive ET to increase water supply for beneficial uses
8	R-4	Provide long-term diversion flexibility to increase water supply for beneficial uses on suitable lands

TABLE 4-2
Targeted Benefits in Colusa Sub-basin
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

CALFED Number	RWMP Sub-basin Number	Targeted Benefit
20	C-1	Provide flow to improve ecosystem conditions in the Sacramento River below Keswick
21	C-2	Reduce Group A pesticides to enhance and maintain beneficial uses of water in the Colusa Drain
22	C-3	Reduce pesticides to enhance and maintain beneficial uses of water in the Colusa Basin Drain
23	C-4	Reduce pesticides to enhance and maintain beneficial uses of water in the Sacramento River
26	C-5	Provide long-term diversion flexibility to increase the water supply for beneficial use for suitable lands
27	C-6	Provide long-term diversion flexibility to increase the water supply for beneficial use for wetlands
28	C-7	Provide long-term diversion flexibility to increase water supply for Sacramento and Delevan National Wildlife Refuges
29	C-8	Provide long-term diversion flexibility to increase the water supply for beneficial uses for salt affected soils

TABLE 4-3
Targeted Benefits in Butte and Sutter Sub-basins
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

CALFED Number	RWMP Sub-basin Number	Targeted Benefit
30	BS-1	Provide flow to improve aquatic ecosystem conditions in the Sacramento River below Keswick
31	BS-2	Reduce pesticides to enhance and maintain beneficial uses of water in the Sacramento River
83	BS-3	Reduce pesticides to enhance and maintain beneficial uses of water in the Sacramento Slough
33	BS-4	Decrease nonproductive ET to increase water supply for beneficial uses for suitable lands
34	BS-5	Provide long-term diversion flexibility to increase water supply for beneficial uses for suitable lands
35	BS-6	Provide long-term diversion flexibility to increase water supply for beneficial uses for wetlands

TABLE 4-4
Targeted Benefits in Lower Feather River and Yuba River
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

CALFED Number	RWMP Sub-basin Number	Targeted Benefit
37	FY-1	Provide flow to improve aquatic ecosystem conditions in Butte Creek
42	FY-2	Reduce salinity to enhance and maintain beneficial uses of water in the Sacramento Slough near Verona
43	FY-3	Reduce temperatures to enhance and maintain aquatic species populations in Butte Creek
46	FY-4	Decrease nonproductive ET to increase water supply for beneficial uses for affected lands
47	FY-5	Provide long-term diversion flexibility to increase water supply for beneficial uses for suitable lands
48	FY-6	Provide long-term diversion flexibility to increase water supply for beneficial uses for wetlands

TABLE 4-5
Targeted Benefits in American Sub-basin
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

CALFED Number	RWMP Sub-basin Number	Targeted Benefit
57	A-1	Provide flow to improve ecosystem conditions in the Sacramento River below Keswick
58	A-2	Reduce pesticides to enhance and maintain beneficial uses of water in the Natomas East Main Drain
59	A-3	Reduce pesticides to enhance and maintain beneficial uses of water in the Sacramento River
63	A-4	Decrease nonproductive ET to increase water supply for beneficial uses.
64	A-5	Provide long-term diversion flexibility to increase the water supply for beneficial uses for suitable lands
65	A-6	Provide long-term diversion flexibility to increase the water supply for beneficial use for wetlands

TABLE 4-6
Summary of Applicable Targeted Benefits and Proposed Actions
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Targeted Benefit	Analyze	Priority	Anticipated Year of Implementation	RWMP Sub-basin (CALFED Sub-region)	Participating SRSCs	Proposed Action	Maximum Contribution to QO from Proposed Action (ac-ft)	Locally Beneficial Portion of Action[a]	Action-specific Monitoring Plan	Funding Sources
R-2 In-stream flow benefit in Sacramento River **R-3** Decrease nonproductive ET	2005	2005	TBD[d]	Redding (1)	ACID	Construct pipeline to replace leaky canal lateral	8,700	$5,000	Action-specific monitoring plan will be included in construction contract	Proposition 50 award of $144,000 June 2005, for feasibility study; Reclamation awarded $30,000 to supplement improvement costs associated with Phase 2A
R-2 In-stream flow benefit in Sacramento River **R-4** Provide long-term diversion flexibility	2005	2005	2012	Redding (1)	ACID	Reduce spill through system automation	20,000	$20,000	Action-specific monitoring plan will be included in construction contract	Proposition 50 award of $1.775 million June 2005, for Phase 1 of construction
R-2 In-stream flow benefit in Sacramento River **R-4** Provide long-term diversion flexibility	2005	2005	2012	Redding (1)	ACID	Construct two groundwater extraction wells	5,600	$124,000	Well output will be monitored	Proposition 50, Chapter 8 award of $1.4 million for Integrated Regional Water Management
R-2 In-stream flow benefit in Sacramento River	TBD[d]	TBD[d]	TBD[d]	Redding (1)	ACID	Replace existing canal creek crossing with new siphon beneath Olney Creek	2,100	$62,500	Action-specific monitoring plan will be included in construction contract	TBD
R-2 In-stream flow benefit in Sacramento River	2011	2011	2012-13	Redding (1)	ACID	Repair and stabilize siphon segment crossing beneath Clear Creek.	5,400	$1,750,000	Action-specific monitoring plan will be included in construction contract	ACID; TBD
R-2 In-stream flow benefit in Sacramento River **R-3** Decrease nonproductive ET	2011	2011	2012-14	Redding (1)	ACID	Replace degraded pipelines; construct pipelines to replace laterals and canals subject to leakage	3,000	TBD[c]	Action-specific monitoring plan will be included in construction contract	ACID
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2007	2008	2012	Colusa (3)	GCID	GCID Water Conservation and Management Project implementation. The project includes a water distribution system (SCADA) system expansion and Ethernet upgrade, and Main Canal and Main Pump Station automation; replacement of three older check structures on the Main Canal with new automated check structures; SCADA integration with drain outflow measurement and recapture stations	40,000	$1,772,200	Monitor diversions, spills, and system outflows	Proposition 50 WUE Grant award of $2.7 million in January 2008
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2005	2005	TBD[d]	Colusa (3)	GCID	Construct up to 16 groundwater extraction wells	30,000	$17,200,000	Well output will be monitored	Submitted for Proposition 50, Chapter 8 funding for Integrated Regional Water Management
C-1 In-stream flow benefit in Sacramento River **C-2, C-3, and C-4** Reduce pesticides **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2005	2005	TBD[d]	Colusa (3)	GCID	Construct 500 ac-ft regulating reservoir on Main Canal	500	$3,500,000	Action-specific monitoring plan will be included in construction contract	TBD

TABLE 4-6
Summary of Applicable Targeted Benefits and Proposed Actions
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Targeted Benefit	Analyze	Priority	Anticipated Year of Implementation	RWMP Sub-basin (CALFED Sub-region)	Participating SRSCs	Proposed Action	Maximum Contribution to QO from Proposed Action (ac-ft)	Locally Beneficial Portion of Action[a]	Action-specific Monitoring Plan	Funding Sources
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2005	2005	2012	Colusa (3)	RD 108	Install up to three production wells for groundwater management program	8,000	$128,800	Well output will be monitored	Received Proposition 50, Chapter 8 funding for Integrated Regional Water Management
C-5, C-6, and C-8 Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2009	2009	2012	Colusa (3)	RD 108	Characterize the groundwater system underlying the northern portion of the District	0	$31,000	Collect and organize groundwater data to develop information	Proposition 84 Grant to provide $245,000
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2005	2005	TBD[d]	Colusa (3)	PCGID	Develop a conjunctive water management program	5,000	TBD[c]	Well output will be monitored	PCGID will fund the program with District monies
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2005	2005	TBD[d]	Colusa (3)	PID	Develop a conjunctive water management program	5,000	TBD[c]	Well output will be monitored	PID will fund the program with District monies
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET **BS-6** Provide long-term diversion flexibility	2005	2005	TBD[d]	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Line canal	7,500	$120,000[b]	Action-specific monitoring plan will be included in construction contract	Funding will be pursued through future rounds of Water Use Efficiency Grant Funding
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET **BS-5, BS-6, FY-5, and FY-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands	2005	2005	TBD[d]	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Construct two groundwater extraction wells	5,000	$40,000[b]	Well output will be monitored	Submitted for Proposition 50, Chapter 8 funding for Integrated Regional Water Management
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET **FY-1** In-stream flow benefit in Butte Creek	2003	2004	2007 (additional phases remain)	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Remove and replace White Mallard Dam and fish ladder on Butte Creek (completed) Install weir and fish screen	17,000	$25,000	Creek diversion will be monitored	First phase funded by Ducks Unlimited at $1.4 million; second-phase funding of $4 million sought through Ducks Unlimited
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands **FY-1** In-stream flow benefit in Butte Creek	2008	2009	2009 (additional phases remain)	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Rebuild recirculation pump	3,800	$63,200[c]	Lift pump that recycles drainage water will be monitored	Funded by RD 1004 at a cost of $63,200
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6 Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands**	2005	2005	2012	Butte and Sutter (4)	MFWC	Construct one groundwater production well	1,000	$70,000	Well output will be monitored	Funded by Proposition 50, Chapter 8 funding for Integrated Regional Water Management. Solicitations for bids expected by the end of 2011

TABLE 4-6
Summary of Applicable Targeted Benefits and Proposed Actions
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Targeted Benefit	Analyze	Priority	Implement	RWMP Sub-basin (CALFED Sub-region)	Participating SRSCs	Proposed Action	Maximum Contribution to QO from Proposed Action (ac-ft)	Locally Beneficial Portion of Action[a]	Action-specific Monitoring Plan	Funding Sources
BS-1 In-stream flow benefit in Sacramento River	2001	2006	2012	Butte and Sutter (4)	MFWC	Install fish screen on main Meridian diversion. Enlarge Main Canal and remove one river diversion	TBD	TBD[b]	Output will be monitored	Federal and state
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands	2005	2005	TBD[d]	Butte and Sutter (4)	SMWC, PMWC and RD 1500	Recycle irrigation	25,000	$12,000[b]	Lift pumps that recycle drainage water will be monitored	Funding for feasibility study will be pursued through future rounds of WUE Grant funding
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands	2009	TBD	TBD[d]	Butte and Sutter (4)	SMWC, PMWC, and RD 1500	Expansion of the existing drainwater reuse system	5,000	TBD[b]	TBD	Funding will be pursued through future rounds of federal and state grant funding opportunities
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET	2012	2012	2015	Butte and Sutter (4)	SMWC	Line canal	1,000	$14,000[b]	Action-specific monitoring plan will be included in construction contract	Submitted for Proposition 50, Chapter 8 funding for Integrated Regional Water Management
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands	2011	2011	2015	Butte and Sutter (4)	SMWC, PMWC, and RD 1500	Install six production wells for groundwater management program	5,000	$200,000[b]	Well output will be monitored	Submitted for Proposition 50, Chapter 8 funding for Integrated Regional Water Management
A-1 In-stream flow benefit in Sacramento River **A-4** Decrease nonproductive ET **A-5 and A-6** Provide long-term diversion flexibility	2005	2005	TBD[d]	American (7)	NCMWC	Construct 13 groundwater extraction wells	15,000	$200,000[b]	Well output will be monitored	Submitted for Proposition 50, Chapter 8 funding for Integrated Regional Water Management
A-1 In-stream flow benefit in Sacramento River **A-4** Decrease nonproductive ET **A-5 and A-6** Provide long-term diversion flexibility	2007	2010	2010-2012	American (7)	NCMWC	Install new pump station and fish screen on Sacramento River	1,400	$0	River diversion will be monitored	CALFED and Reclamation awarded $1.5 million for design and permitting
A-1 In-stream flow benefit in Sacramento River **A-4** Decrease nonproductive ET **A-5 and A-6** Provide long-term diversion flexibility	2007	2007	2010 (additional phases remain)	American (7)	NCMWC	Improve flow monitoring in Natomas Basin	4,500	$187,000	Flows within NCMWC and between districts will be monitored	Proposition 50 WUE Grant awarded $163,000; NCMWC paid the remaining $187,000
Total SRSC Contribution							224,500	$25,524,700		

[a]Cost-benefit analysis will be performed if funding is not received to determine what portion of project, if any, is economically feasible for a local agency to undertake. The presentation of these local and external benefits and the associated costs will be included in the annual updates at the time the QOs are analyzed.

[b]Local funding amount varies depending on type and application of project. Historical average of local contribution varies from 5 to 20 percent of project cost provided through in-kind services by the Company/District. Five percent of estimated project cost was used for projects yet to apply for funding. The local contribution for these projects will be updated as funding is sought and acquired.

[c]Project is 100 percent District funded. Exact amount will be determined at project completion.

[d]Subject to appropriation of funding.

Note:

WUE = Agricultural Water Use Efficiency Program

TABLE 4-7
Summary of Applicable Targeted Benefits and Implemented Actions
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Targeted Benefit	Implemented	RWMP Sub-basin (CALFED Sub-region)	Participating SRSCs	Implemented Action	Estimated Contribution to QO from Action (ac-ft)	Locally Beneficial Portion of Action	Action-specific Monitoring Plan	Funding Sources
R-1 Remove flow impediment in Cottonwood Creek	2010	Redding (1)	ACID	Remove and replace siphon segment crossing beneath Cottonwood Creek	8,900	$288,000	Action-specific monitoring plan will be included in construction contract	ACID and the USFWS Anadromous Fish Restoration Program provided $130,000
R-2 In-stream flow benefit in Sacramento River **R-3** Decrease nonproductive ET	2012 (additional phases remain)	Redding (1)	ACID	Replace degraded pipelines; construct pipelines to replace laterals and canals subject to leakage	4,000	See Table 4-6	Action-specific monitoring plan will be included in construction contract	ACID
C-1 In-stream flow benefit in Sacramento River	2010	Colusa (3)	GCID	Measure GCID drainwater outflow to reduce tailwater spills; GCID completed construction of 12 drainwater outflow measuring sites in 2010; Construct an automated inflatable Obermeyer steel gated weir on the Colusa Basin Drain to maximize year-round diversions to crops and wildlife habitat	20,000	$650,000	Flows will be monitored to reduce spills	GCID and a Reclamation Water Conservation Grant provided $200,000
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2009	Colusa (3)	RD 108	Replace flashboard checks with long-crested weirs, an ITRC flap gate, and Rubicon flume gates	2,000	$300,000	Action-specific monitoring plan will be included in construction contract	RD 108 and a Reclamation Water Conservation Grant provided $300,000
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2011	Colusa (3)	RD 108	Increase capacity of recycled water	13,000	$50,000	Flows will be monitored to recapture spills and reduce outflows	RD 108 and a Reclamation CALFED Grant provided $560,000
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2011	Colusa (3)	RD 108	Improve operations of recycled water pump stations	3,700	$235,000	Flows will be monitored to recapture spills and reduce outflows	RD 108 and a Reclamation CALFED Grant provided $560,000
C-5, C-6, and C-8 Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2009	Colusa (3)	RD 108	Groundwater resources characterization	0	$0	Well output, groundwater monitoring wells, and subsidence will be monitored	RD 108
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2012	Colusa (3)	RD 108	Irrigation scheduling	5,500	$31,000	Applied water to the field will be monitored	RD 108 and a Reclamation Water Conservation Grant provided $25,000

TABLE 4-7
Summary of Applicable Targeted Benefits and Implemented Actions
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Targeted Benefit	Implemented	RWMP Sub-basin (CALFED Sub-region)	Participating SRSCs	Implemented Action	Estimated Contribution to QO from Action (ac-ft)	Locally Beneficial Portion of Action	Action-specific Monitoring Plan	Funding Sources
C-1 In-stream flow benefit in Sacramento River **C-5, C-6, and C-8** Provide long-term diversion flexibility for wetlands, salt-affected soils, and other suitable lands	2007	Colusa (3)	RD 108	Rice water conservation program	5,000	$0	Diversions and outflows will be monitored	RD 108
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET **FY-1** In-stream flow benefit in Butte Creek	2007 (additional phases remain)	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Remove and replace White Mallard Dam and fish ladder on Butte Creek; Install weir and fish screen (yet to be completed)	17,000	$25,000	Creek diversion will be monitored	First phase funded by Ducks Unlimited at $1.4 million; second-phase funding of $4 million sought through Ducks Unlimited
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET **BS-5, BS-6, FY-5, and FY-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands **FY-1** In-stream flow benefit in Butte Creek	Ongoing	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Upgrade field-level flowmeters	1,600	$67,500	Field-level turnouts will be monitored, allowing RD 1004 to charge water users by the ac-ft	Individual farmers paid for initial flowmeters at approximately $1,000 each in 1992; upgrades cost an estimated $67,500; and meter maintenance, estimated at $7,000 /year, is paid for by the District
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands **FY-1** In-stream flow benefit in Butte Creek	2009 (additional phases remain)	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Rebuild recirculation pump	3,800	$63,200	Lift pump that recycles drainage water will be monitored	RD 1004
BS-1 In-stream flow benefit in Sacramento River **BS-4** Decrease nonproductive ET **FY-1** In-stream flow benefit in Butte Creek	2009	Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Install new check structure and ITRC water gate	70	$2,500	None, gate is designed to automatically provide constant water elevation	RD 1004 and Reclamation Grant
BS-1 In-stream flow benefit in Sacramento River **FY-1** In-stream flow benefit in Butte Creek		Butte and Sutter, Lower Feather River and Yuba River (4,5)	RD 1004	Install a pair of weirs	1,200	$15,000	Increased system control will be provided with new weirs	Reclamation Grant
BS-1 In-stream flow benefit in Sacramento River **BS-5 and BS-6** Provide long-term diversion flexibility to increase water supply for beneficial use of wetlands and other suitable lands	2009 (additional phases remain)	Butte and Sutter (4)	MFWC	Construct two groundwater production wells	1,500	$135,000	Well output will be monitored	MFWC and Proposition 50, Chapter 8 funding for Integrated Regional Water Management

TABLE 4-7
Summary of Applicable Targeted Benefits and Implemented Actions
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Targeted Benefit	Implemented	RWMP Sub-basin (CALFED Sub-region)	Participating SRSCs	Implemented Action	Estimated Contribution to QO from Action (ac-ft)	Locally Beneficial Portion of Action	Action-specific Monitoring Plan	Funding Sources
A-1 In-stream flow benefit in Sacramento River **A-4** Decrease nonproductive ET **A-5 and A-6** Provide long-term diversion flexibility	2010 (additional phases remain)	American (7)	NCMWC	Improve flow monitoring in Natomas Basin (phased approach)	4,500	$187,000	Flows within NCMWC and between districts will be monitored	NCMWC and Proposition 50 WUE Grant
Total SRSC Contribution					**91,770**	**$2,049,200**		

TABLE 4-8
Summary of SRSCs' Contribution to Quantifiable Objectives
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

RWMP Sub-basin Number	SRSC Contribution to QO (taf/yr)		Target QO (taf/yr)[a]
	Proposed Actions	Implemented Actions	
R-1	-	8.9	TBD
R-2	44.8	4.0	44 – 180
R-3	44.8	4.0	6.5[a]
R-4	20	-	TBD
C-1	88.5	49.2	44 – 180
C-2	0.5	-	TBD
C-3	0.5	-	TBD
C-4	0.5	-	TBD
C-5	88.5	29.2	TBD
C-6	88.5	29.2	7.9
C-7	-	-	TBD
C-8	88.5	29.2	TBD
BS-1	70.3	25.47	44 – 180
BS-2	-	-	TBD
BS-3	-	-	TBD
BS-4	30.5	18.97	4.6 taf[b]
BS-5	44.8	6.9	TBD
BS-6	52.3	6.9	4.5
FY-1	-	23.67	TBD
FY-2	-	-	TBD
FY-3	-	-	TBD
FY-4	-	-	11.1[b]
FY-5	-	1.6	TBD
FY-6	-	1.6	10.5
A-1	20.9	4.5	44 – 180
A-2	-	-	TBD
A-3	-	-	TBD
A-4	20.9	4.5	<1 taf[b]
A-5	20.9	4.5	TBD
A-6	20.9	4.5	1

[a]Source: CALFED Water Use Efficiency Draft Details of Quantifiable Objectives (December 2000).
[b]Plus additional water generated through reduction in application through improved irrigation systems.

SECTION 5.0

Identification of Actions to Implement and Achieve Proposed Quantifiable Objectives

Section 5.0 revisions to the RWMP are highlighted below in shaded text. An update of all previously identified projects was completed, and any new projects identified by the SRSCs since the completion of the initial RWMP were added, including description, schedule, budget, and funding sources.

5.1 Redding Sub-basin

Table 5-1 lists and describes potential projects in the Redding Sub-basin.

TABLE 5-1
Potential Projects in the Redding Sub-region
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Title	District	Sub-basin	Description	Potential QO (ac-ft)	Applicable TBs
ACID Churn Creek Lateral Improvements	ACID	Redding	Construct a pipeline to replace a leaky canal lateral in a section east of the Sacramento River	8,700	R-2, R-3
ACID Main Canal Modernization Project	ACID	Redding	Automate the system to reduce spills	20,000	R-2, R-4
ACID Conjunctive Use Program	ACID	Redding	Construct two groundwater extraction wells	5,600	R-2, R-4
ACID and Olney Creek Watershed Restoration Project	ACID	Redding	Replace existing hydraulic structure with an inverted siphon	2,100	R-2
Cottonwood Creek Fish Passage Improvement and Siphon Replacement Project[a]	ACID	Redding	Replace siphon crossing beneath Cottonwood Creek	8,900	R-1
Clear Creek Siphon Improvements Project	ACID	Redding	Repair and stabilize portion of existing siphon	5,400	R-2
System Improvement Program[a]	ACID	Redding	Replace degraded pipelines and pipe laterals and canals subject to leakage	4,000	R-2, R-3

[a]Project has been fully or partially implemented as described in the following sections.

5.2 ACID Churn Creek Lateral Improvements Project

5.2.1 Project Description

ACID proposes to improve its Churn Creek lateral system to increase water delivery and on-farm use efficiencies. The project will have an estimated water savings of up to 8,700 ac-ft and enable landowners to more efficiently apply water. By improving the ACID delivery system, landowners could modify on-farm water application systems from flood irrigation to sprinkler irrigation. Sprinkler irrigation under existing delivery conditions is not viable, but landowners might potentially apply three to four times less water with sprinkler irrigation.

A new pipeline will be the key component to a new pressurized system to serve the Churn Creek Bottom area and replace the existing unlined open ditch. A pressurized system will allow landowners, if feasible to their operations, to modify irrigation practices to significantly reduce water consumption. ACID has been working with Reclamation to introduce a sprinkler pilot program in this area of the District. The new pipeline would extend from the pumping plant on the Sacramento River, eastward to the current junction box structure at Smith Road. This pipeline would replace three canal laterals and extend along the current alignment of these laterals. Additionally, a canal lateral that begins immediately east of Interstate 5 would be replaced with a pipeline. In total, 14 miles of pipeline would be installed, 1.4 miles to replace the existing Churn Creek lateral and 12.6 miles of appurtenant laterals.

This project would also upgrade the current pumping station, located on the Sacramento River, to provide adequate pressure and flow. Two options will be examined for this upgrade. The first option would be to upgrade the existing pumps to provide gravity flow to turnouts located on the lateral. This option includes installing pumps at each turnout to supply the desired pressure and flow for sprinkler systems. The other option is to replace or expand the existing pumps at the pump station to provide necessary pressure and flow to all the ACID turnouts.

Phase 2A is funded and expected to be completed by December 2009. This phase of the ACID Churn Creek Lateral Improvements Project will include the lining of approximately 0.5 mile of the upper portion of ACID's Churn Creek lateral in an area of high soil porosity. The canal prism, including the side slopes and invert, would be shaped, smoothed, and compacted. A layer of geotextile material would then be placed on top of the earthen canal prism. A rubber polymer geomembrane lining would be secured in the canal and provide the top layer of the canal lining. This portion of the overall project buildout is being funded by Reclamation. Additional phases will be conducted as funding is available.

Targeted Benefits for this project are listed in Table 4-6.

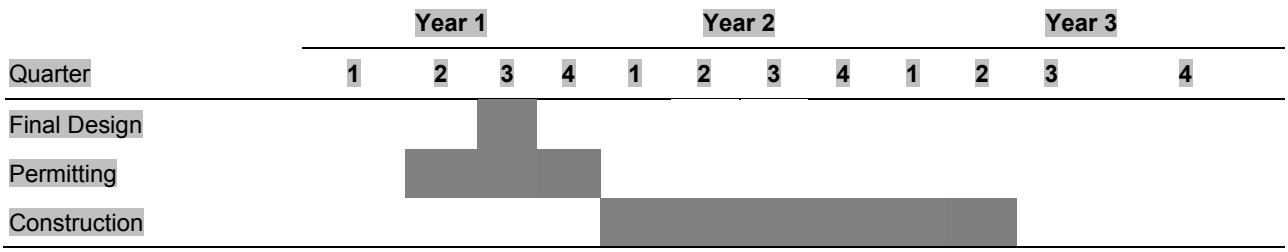
5.2.2 Schedule

The project schedule shown in Table 5-2 will commence upon appropriation of funding. The proposed schedule assumes that funding requests and appropriations occur within one phase. This project would likely be completed in several phases. Depending on the actual availability of funding, the implementation timeframe for completion of tasks could extend beyond the schedule shown in Table 5-2.

TABLE 5-2
ACID Churn Creek Lateral Improvements Project Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Feasibility	Phase 1 (feasibility study) was completed in 2003; given project conditions and assumptions have changed to some degree, an update of the current feasibility study would be required before commencing design
Pilot Program	Ongoing for 2005 irrigation season; cooperative program between Reclamation and ACID
Environmental Document	A programmatic draft environmental impact report was completed in January 2007, but has not been adopted by the Shasta County Water Agency. Supplemental documentation and permitting is expected to be required during design.
Phase 2A	Phase 2A was not implemented because of unresolved issues with adjoining private landowners; funding expired. Attempts to secure funding are ongoing.

Project Duration – Work to be Completed (Buildout)



5.2.3 Cost and Funding Sources

The estimated cost for the ACID Churn Creek Lateral Improvements Project feasibility study was $144,000. ACID received funding for the study through the Department's Agricultural Water Use Efficiency Program funded through State Proposition 50. As a result, preliminary findings for lateral improvements were developed. In addition, ACID has worked with Reclamation to fund phased improvements along the upper end of the Churn Creek lateral (see description of Phase 2A). Reclamation has awarded $30,000 funding to ACID, combined with local cost share, to improve 300 feet of the lateral.

ACID continues to work with the Department to find ways to partner on projects that will result in improved management and efficiencies within the Churn Creek lateral system. Prior to the budget crisis and subsequent freeze on California bond funding, the Department had been responding favorably to the idea of continued funding for this project.

ACID sought funding to complete a portion of this project in 2011 through the Reclamation WaterSMART program, but the application was unsuccessful.

Funding sources are listed in Table 4-6.

5.3 ACID Main Canal Modernization Project

5.3.1 Project Description

In 2000, ACID recognized a need to improve its delivery system. In 2002, ACID completed a feasibility study in partnership with the Department that identified high-priority

improvements for its Main Canal system. ACID is following through with its commitment to improving the efficiency of its system and is continuing to work in conjunction with the state to implement these system improvements in a phased approach. To conserve water and more efficiently use its surface water resource, ACID has identified the following five primary improvements:

- Lining of five high-seepage canal segments (approximately 2 miles of the 35-mile earthen Main Canal)
- Installation of five new automated check structures to provide much-needed (and currently lacking) water surface elevation control
- Installation of 12 new, automated turnouts with measurement flumes
- Replacement of two creek crossings to hydraulically separate the Main Canal from Olney Creek and Crowley Gulch
- Repair of two inverted siphon creek crossings at Clear Creek and Cottonwood Creek

These improvements, resulting in significantly better operational control, could also result in a combined estimated annual water savings of up to approximately 20,000 ac-ft when completed.

Targeted Benefits for this project are listed in Table 4-6.

5.3.2 Schedule

Preliminary design was completed for several of the above projects, and three of the projects were chosen for final design based on system priority and available funding: replacement of the Crowley Gulch crossing with an inverted siphon and two automated check structures. Bids were received in August 2011 and the Crowley Gulch siphon project was chosen for construction based on the bids and available funding.

TABLE 5-3
ACID Main Canal Modernization Project Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Feasibility Study	Completed
Environmental Document, Phase 1	Environmental document is complete
Permitting, Phase 1	Permitting is complete
Final Design, Phase 1	Final design is complete
Construction, Phase 1	Construction is expected to begin in March 2012 and be completed by July 2012

	Project Duration – Work to be Completed (Future Phases)											
	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Final Design, Buildout												
Environmental Documentation and Permitting, Buildout												
Construction, Buildout												

5.3.3 Cost and Funding Sources

The estimated construction cost for the ACID Main Canal Modernization Project was $10.8 million in 2002. This order-of-magnitude cost was determined as part of a feasibility study (Phase 1A, April 2002). Using a standard assumption of 4 percent escalation, this project is now estimated to cost approximately $12.3 million. The cost estimate will be refined during final design. ACID is seeking grant monies through the state to implement future phases of this project. Phase 1 of the project has been funded jointly by ACID and the Department through the Agricultural Water Use Efficiency Program for a total of $1,775,000. Phase 1 construction is expected to be completed by summer 2012. Project status will be presented in future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.4 ACID Conjunctive Water Management Program

5.4.1 Project Description

ACID is advancing a conjunctive water management program that would responsibly and efficiently develop a vastly underused groundwater basin that is subject to extensive natural recharge. As an active participant on the Redding Area Water Council and in the SVWMP, ACID recognizes the need to conjunctively manage surface water and groundwater resources to meet projected regional demands and satisfy the Phase 8 Settlement Agreement.

The project would supply water to meet peak demands during drought years, and it could provide additional benefits during normal and wet years. Any solution to water supply and reliability needs here, in the area of origin, would potentially result in water supply, water quality, and environmental benefits to the Redding Sub-basin and the Bay-Delta region.

ACID has a Sacramento River diversion and an extensive conveyance system throughout the west side of the Redding Sub-basin, which overlies a highly productive aquifer. This combination of attributes offers ACID a unique opportunity to provide regional solutions to the sub-basin, which does not meet projected water supply demands in dry years, especially during CVP cut-back years. The ACID Conjunctive Water Management Program would accomplish the following goals and objectives:

- Establish a groundwater monitoring network (This effort is underway. ACID works with the Department to monitor 13 existing groundwater monitoring wells and continues to seek additional funding for expansion of the monitoring network.)
- Establish a groundwater production program that, in Phase 1, would provide up to 5,600 ac-ft/yr of supplemental water supply to offset surface water diversions from the Sacramento River
- Satisfy the water supply and reliability needs of agricultural water users in the ACID service area
- Help satisfy the water supply and reliability needs of in-basin water users in the Redding Basin Water Resources Management Plan
- Contribute to the Sacramento Valley Water Management Agreement

Targeted Benefits for this project are listed in Table 4-6.

5.4.2 Schedule

The project schedule shown in Table 5-4 will commence upon appropriation of funding.

TABLE 5-4
ACID Conjunctive Water Management Program Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Install Groundwater Monitoring Infrastructure	Continues; 13 monitoring wells are currently installed, providing baseline data for effective basin water management; data are collected by Department Northern District staff
Feasibility and Pre-design	Completed; potential well locations were identified in 2000
Groundwater Management Planning	Ongoing since the late 1990s
Environmental Document	The final Environmental Assessment/Initial Study and Finding of No Significant Impact/Mitigated Negative Declaration was approved in November 2011.

Project Duration – Work to be Completed

	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Final Design												
Permitting												
Construction												
Implementation	For at least 10 years, assuming there is no demonstrated impact to sustainability											

Environmental assessments and documentation for this project were initiated in early 2011 to provide both state and federal compliance for the construction of two groundwater production wells. A new groundwater model – REDFEM – was developed by ACID and CH2M HILL to analyze potential impacts of the project and to provide supporting documentation for the California Environmental Quality Act and National Environmental Policy Act analyses. Reclamation produced a Finding of No Significant Impact and ACID produced a Mitigated Negative Declaration that were released for public review in September 2011. The documents were approved in November 2011.

Following approval of the environmental assessments, the necessary permitting will be completed and bids sought for construction in early 2012; it is expected that construction will commence in the first quarter of 2012.

5.4.3 Cost and Funding Sources

The cost for the development of the ACID Conjunctive Water Management Program is estimated to be $3.2 million. ACID sought public assistance to implement this program through the Sacramento Valley Integrated Regional Water Management Plan (SVIRWMP) and California State Proposition 50 Grants. The former provided funding of $1.24 million

plus 10 percent local cost share. The development and implementation of this program will be documented in future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.4.4 ACID Olney Creek Watershed Restoration Project

5.4.4.1 Project Description

ACID proposes with its project partners to remove the Olney Creek structure, siphon the ACID Canal under the creek, and improve the Olney Creek banks.

At the intersection of the ACID Main Canal and Olney Creek, an approximate 80-year-old structure exists that was intended to convey ACID irrigation water above the creek bed during the irrigation season and flood flows from Olney Creek in the winter. Flow through the structure is directed by placing (or removing) flashboards on all four sides of the rectangular structure. The configuration of the structure and the use of the flashboards leave the structure subject to vandalism, resulting in unwanted spills and public safety issues. From a hydraulic and hydrologic standpoint, the configuration is undesirable, resulting in inefficient deliveries and spills to the creek that can cause unnaturally high flows during dry summer months and, in some cases, false attraction and subsequent stranding of salmon in otherwise dry or warmwater streams.

Furthermore, the canal banks have deteriorated to the point that they no longer provide adequate protection to residential areas in low-lying downstream areas. In the winter of 2005-2006, more than 20 mobile homes in a mobile home park incurred several feet of flood damage (ranging from 6 inches to 5 feet) due to a low point in an approximate 150-foot reach between a 1,900-foot levee and the ACID Main Canal.

ACID is working in cooperation with local and regional partners, including USFWS, CDFG, and the McConnell Foundation to help restore and rehabilitate the Olney Creek floodway in the vicinity of the creek's intersection with the ACID Main Canal.

The objectives for the ACID Olney Creek Watershed Restoration Project are as follows:

- Provide flood damage reduction through bank restoration to provide 25-year flood protection to more than 20 homes of a disadvantaged community downstream of a deteriorated creek bank.
- Restore the natural creek bed by hydraulically separating the ACID Main Canal from Olney Creek (i.e., siphoning the canal under the creek).
- Lessen public safety concerns by removing a potentially dangerous structure that is often vandalized during the irrigation season and rainy season.
- Prevent the conveyance of flood flows to areas outside of the Olney Creek watershed by hydraulically separating the creek from the canal.
- Prevent unnatural fish attraction flows within the creek caused by unintended canal spills, yet allow controlled flows as desired by the resource agencies by installing a turnout from the canal to the creek.
- Prevent debris buildup that can negatively affect water quality.

The total water loss can be up to 2,100 ac-ft/yr. Targeted Benefits for this project are listed in Table 4-6.

5.4.4.2 Schedule

The proposed schedule is shown in Table 5-4A.

TABLE 5-4A

ACID Olney Creek Watershed Restoration Project Schedule

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	**Project Status – Ongoing and Completed Work**
Administrative	Attempts to secure funding have so far been unsuccessful, but are ongoing as opportunities arise.

	Project Duration – Work to be Completed											
	Year 1				**Year 2**				**Year 3**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Final Design												
Environmental Documentation												
Construction												

5.4.4.3 Cost and Funding Sources

This project has great appeal to several resource agencies because of the myriad of regional benefits. This project unsuccessfully sought funding from the Department in a grant round in 2008 through the watershed and parks and trails divisions, at which time the overall project cost estimate was $1.7 million. ACID subsequently recruited several partners for this project including USFWS, CDFG, the McConnell Foundation, and local landowners to seek alternative funding sources. In 2009, ACID partnered with an adjoining landowner and the Sacramento Watersheds Action Group for submittal of a project proposal for Proposition 84 funding. This proposal was also unsuccessful. ACID remains committed to seeking available funding sources for this project.

Funding sources are listed in Table 4-6.

5.4.5 Cottonwood Creek Fish Passage Improvement and Siphon Replacement Project

5.4.5.1 Project Description

The Cottonwood Creek siphon is a 48-inch-diameter inverted siphon, built around 1920, that carries the ACID Main Canal beneath Cottonwood Creek. The Cottonwood Creek Fish Passage Improvement and Siphon Replacement Project, completed in November 2010, replaced a 200-foot section of the existing siphon with a new siphon of similar size placed at a depth 8 feet below the original structure. Because the siphon had become exposed in the active stream channel due to streambed degradation, the regulatory agencies felt it was a potential impediment to passage of anadromous fish species.

This project improved the physical habitat for all life stages of anadromous fish, and the opportunity for adult fish to reach their spawning habitats in a timely manner, and restored natural channel and riparian habitat values. This project improved aquatic ecosystem conditions in Cottonwood Creek by removing a potential flow impediment. From ACID's perspective, the project also replaced an aged concrete pipeline that had been compromised due to its exposure in the active stream channel to sediment scouring and debris impacts, resulting in the avoidance of potential catastrophic failure.

Targeted Benefits for this project are listed in Table 4-6.

5.4.5.2 Schedule

The project schedule for funding is shown in Table 5-4B.

TABLE 5-4B
Cottonwood Creek Fish Passage Improvement and Siphon Replacement Project Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Administrative	Secured partial funding from USFWS in 2009
Environmental and Permitting	Completed environmental compliance and permitting in late 2010

	Project Duration – Work to be Completed											
	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Engineering												
Permitting												
Mobilization/Monitoring												

5.4.5.3 Cost and Funding Sources

This proposal was submitted in June 2008, for funding through the USFWS Anadromous Fish Restoration Program. The proposal was not awarded funding, but District management was informed that this project had been moved to near the top of the Program's priority list for fiscal year 2009, and was awarded $130,000 in 2009.

All environmental compliance and permitting were completed in January through October 2010, and construction began in October 2010. Substantial completion of the project was achieved in November 2010 at a total cost of just over $400,000.

Funding sources are listed in Table 4-7.

5.4.6 System Improvement Program

5.4.6.1 Project Description

In 2008, ACID began a System Improvement Program to replace degraded or inefficient pipelines and to pipe earthen laterals and canals that were subject to leakage. Through

September 2011, implementation of this Program resulted in the installation of 4,110 linear feet of pipe, varying in size from 18- to 48-inch-inside diameter. A summary of the completed projects is provided in Table 5-4C.

TABLE 5-4C
System Improvement Program – Completed Projects
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Description	Diameter (inch) by Length (ft)
Lateral 29 – Perry's Pond	24 by 860
Clear Creek Siphon	Repair
Spring Gulch Flume – support pillar	Repair
Lateral 29 – west of Balls Ferry/Lone Tree Roads	24 by 160
Lateral 37 – south of Adobe Road	24 by 30
Lateral 35 – north of Balls Ferry/Adobe Roads	24 by 370
Lateral 37 – Adobe Road	18 by 440
Lateral 21 – southwest of Rupert Road	24 by 300
Lateral 27, east of Hawes Road	18 by 300
Cottonwood Creek Siphon[a]	48 by 200
Lateral 21, between Deschutes Road and Gaines Lane	24 by 300
Pick-up Ditch	24 by 100
Lateral 33	18 by 80
Clear Creek Siphon	Study
Lateral 29.2, south of Kimberly Road	24 by 550
Lateral 33.2, Spoon Lane	18 by 120
Lateral 41, north of 4th Street	18 by 140
March 2009, Lateral 21.3[b]	24 by 40
July 2009[b]	18 by 40
October 2009[b]	15 by 40
November 2009[b]	36 by 20

[a]The Cottonwood Creek Fish Passage Improvement and Siphon Replacement Project was implemented with partial funding and support from USFWS, in which 200 feet of 48-inch-diameter pipeline that had become exposed in the creek channel due to streambed degradation was replaced at a depth 8 feet below the streambed. The purpose of the project was to replace the damaged and leaking pipe and re-bury the siphon to improve fish passage; Cottonwood Creek provides critical habitat to numerous anadromous fish species.

[b]Unlisted installations/repairs.

5.4.6.2 Cost and Funding Sources

The cost of the program to date is just over $550,000. Of this total, $420,000 was paid directly from ACID reserve funds.

Funding sources are listed in Table 4-6.

5.5 Colusa Sub-basin

Table 5-5 lists and describes potential projects in the Colusa Sub-basin.

TABLE 5-5
Potential Projects in the Colusa Sub-basin
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Title	District	Sub-basin	Description	Potential QO (ac-ft)	Applicable TBs
GCID Water Conservation and Management Project	GCID	Colusa	GCID Water Conservation and Management Project implementation. The project includes a water distribution system SCADA system expansion and Ethernet upgrade, and Main Canal and Main Pump Station automation. Replacement and modernization of three older checks with new automated main canal checks. SCADA integration with drain outflow measurement and recapture stations.	40,000	C-1, C-5, C-6, C-8
GCID Conjunctive Water Management Program	GCID	Colusa	Development of a ground-water program consistent with GCID and regional objectives, inclusive of both groundwater monitoring and extraction. Extraction could result from pumping of privately owned and/or up to 16 District wells.	30,000	C-1, C-5, C-6, C-8
GCID Drain Water Outflow Measurement Program[a]	GCID	Colusa	Construct 12 flow measurement sites with telemetry dedicated to the measurement of GCID system outflows. Construct an automated inflatable steel gated weir on the Colusa Basin Drain to measure flows made available by upslope irrigation districts for supply to water users downstream of the weir. The weir can aid in maximizing year-round diversions to crops and wildlife habitat.	20,000	C-1, C-5, C-6, C-8
GCID Main Canal M.P. 35.6 Regulating Reservoir Project.	GCID	Colusa	GCID proposes to regulate peak flows in the Main Canal and dampen flow fluctuations by constructing a 500-ac-ft regulating reservoir at Main Canal M.P. 35.6 right. The reservoir facilities will include	500	C-1, C-5, C-6, C-8

TABLE 5-5
Potential Projects in the Colusa Sub-basin
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Title	District	Sub-basin	Description	Potential QO (ac-ft)	Applicable TBs
			a pump station on the Main Canal, an outlet control system, and flow volume instrumentation.		
Strategic Plan for Groundwater Resources Characterization	RD 108	Colusa	A comprehensive review of past studies and data covering the area in and around the District to identify the approach the District should take to gain a better understanding of the groundwater basin.	0	C-5, C-6, C-8
RD 108 Conjunctive Water Management Program	RD 108	Colusa	Installation of up to three production wells for groundwater management program.	8,000	C-1, C-5, C-6, C-8
RD 108 Flow Control and Measurement Project[a]	RD 108	Colusa	Replace flashboard checks with long-crested weirs, an ITRC flap gate, and Rubicon flume gates.	2,000	C-1, C-5, C-6, C-8
RD 108 Northern Area Groundwater Study	RD 108	Colusa	Characterize the groundwater system underlying the northern portion of the District.	0	C-5, C-6, C-8
RD 108 Recycled Water Improvement Project[a]	RD 108	Colusa	Increase capacity of existing recycled water pump stations.	15,000	C-1, C-5, C-6, C-8
RD 108 Recycled Water Management Project[a]	RD 108	Colusa	Improve the operations and management of three existing recycled water pump stations.	4,000	C-1, C-5, C-6, C-8
RD 108 Irrigation Scheduling Program[a]	RD108	Colusa	Develop software to help growers improve their irrigation efficiency by using weather and soil moisture information to predict crop water needs.	5,500	C-1, C-5, C-6, C-8
RD 108 Rice Water Conservation Program[a]	RD 108	Colusa	Implement a program that offers rice growers rebates to reduce or eliminate tailwater during the maintenance period of rice cultivation.	5,000	C-1, C-5, C-6, C-8
PCGID Conjunctive Water Management Program	PCGID	Colusa	Development of a conjunctive water management program.	5,000	C-1, C-5, C-6, C-8
PID Conjunctive Water Management Program	PID	Colusa	Development of a conjunctive water management program.	5,000	C-1, C-5, C-6, C-8

[a]Project has been fully or partially implemented as described in the following sections.

Note:

M.P. = milepost

5.6 GCID Water Conservation and Management Project

5.6.1 Project Description

This project is expected to conserve a maximum of 40,000 ac-ft of water annually.

GCID proposes to automate its main canal structures to increase water use efficiency. Operational spills would be reduced by automated water level control and replacing three old check structures on the main canal.

Further improvements include upgrading GCID's telemetry to a spread spectrum ethernet system, developing software for canal gate operation, standardizing software, installing sensors, providing mobile SCADA units and upgrading the central office hardware.

When possible, construction occurs outside of the irrigation season. The main canal conveys water year-round; however, many of the laterals do not require year-round deliveries. Canal bypasses would maintain main canal flows and deliveries during construction.

Targeted Benefits for this project are listed in Table 4-6.

5.6.2 Schedule

The project schedule shown in Table 5-6 will commence upon appropriation of funding. The construction of this project will be executed in phases and is not expected to be completed in its entirety within the duration of this RWMP.

TABLE 5-6
GCID Water Conservation and Management Project Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	**Project Status – Ongoing and Completed Work**
Feasibility and Pre-design	Completed as part of the wildlife refuge water supply
Environmental Document	Programmatic document is completed; supplemental documentation and permitting is expected to be required during design
Implementation	Implementation is in final stages and expected to be completed by 2015

	Project Duration – Work to be Completed											
	Year 1				**Year 2**				**Year 3**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Final Design												
Supplemental Environmental Documentation and Permitting												
Implementation												

5.6.3 Cost and Funding Sources

The estimated construction cost for all phases of the GCID Water Conservation and Management Project was $8.7 million in 2001. Using a standard assumption of 4 percent escalation, this project is now estimated to cost approximately $11.9 million. GCID received

$2.7 million for automation and SCADA upgrades through California State Proposition 50 Grants. The development and implementation of this program will be documented in future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.7 GCID Conjunctive Water Management Program

5.7.1 Project Description

GCID is moving forward with the expansion and development of an existing conjunctive water management program. GCID has evaluated the need for conjunctive management of its groundwater and surface water resource annually. In years of constrained surface water supply (due to infrastructure failures or drought years), GCID has worked with its land-owners to develop annual voluntary groundwater programs (e.g., the 2001 Forbearance Program). GCID is formalizing its groundwater programs into a conjunctive water management program that would provide for the coordinated operation of a network of existing and planned groundwater wells within the GCID service area. The system may be composed of private groundwater wells, five existing GCID wells, and up to 16 planned GCID wells. The total production capability of the program is expected to be approximately 30,000 ac-ft of water per year. Implementation of the program would be flexible as prescribed in an operating plan (to be developed), allowing the water to be produced in various scenarios.

Targeted Benefits for this project are listed in Table 4-6.

5.7.2 Schedule

The project schedule shown in Table 5-7 will commence upon appropriation of funding.

TABLE 5-7
GCID Conjunctive Water Management Program Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Install Groundwater Monitoring Infrastructure	In progress since the 1990s with Glenn County and more recently with SVWMP and Colusa County
Installation of Groundwater Production Infrastructure	In progress; one well installed in 2005 as part of a pilot program. Three additional test wells were installed in 2010 as part of the Lower Tuscan Aquifer Study program
Groundwater Management Planning	Ongoing since late 1990s
Environmental Document	In progress; to be completed upon completion of pumping tests to analyze any significant impact to aquifer

	Project Duration – Work to be Completed											
	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Final Design												
Permitting												
Construction												
Implementation	→ For at least 10 years, assuming there is no demonstrated impact to sustainability											

5.7.3 Cost and Funding Sources

The cost for the development of the GCID Conjunctive Water Management Program is estimated to be $17.2 million. GCID is seeking grant funding to assist with implementation; however, program costs are anticipated to be assessed to GCID's landowners. The development and implementation of this program will be documented in future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.8 GCID Colusa Basin Drain Regulating Reservoir Project

5.8.1 Project Description

Project description has been removed because GCID is no longer pursuing implementation of this project.

5.8.2 Schedule

Project schedule has been removed because GCID is no longer pursuing implementation of this project.

5.8.3 Cost and Funding Sources

Project budget has been removed because GCID is no longer pursuing implementation of this project.

5.8.4 GCID Drain Water Outflow Measurement Program

5.8.4.1 Project Description

GCID has completed construction of 12 flow measurement sites with telemetry that are dedicated to the measurement of GCID system outflows. This project would improve water management within GCID and, conceivably, throughout the sub-basin.

Only daily measurements were collected at the 12 locations where approximately 75 percent of drain water leaves the District. Upgrading to continuous measurements allows water operators to manage diurnal flow fluctuations to save an estimated 30 percent of the current main canal and lateral spills. This would result in an estimated savings of up to 15,000 ac-ft annually.

An additional project for this measurement program was to construct an automated steel gated weir on the Colusa Basin Drain at its approximate north to south midpoint. This measuring site will measure flows made available by upslope irrigation districts for supply to water users downstream of the weir and provide information to refine the Colusa Sub-basin water balance.

The weir can aid in maximizing year-round diversions to crops and wildlife habitat.

5.8.4.2 Schedule

The project was completed in 2011.

5.8.4.3 Cost and Funding Sources

GCID sought funding through a Reclamation Water Conservation Grant in June 2007. The total project cost was estimated at $200,000 and would be split evenly between Reclamation and GCID. Construction was completed with higher than anticipated costs. The Colusa Basin Drain weir added an additional $500,000 to the project cost.

Funding sources are listed in Table 4-7.

5.8.5 GCID Main Canal Milepost 35.6 Regulating Reservoir Project

5.8.5.1 Project Description

GCID proposes to help regulate peak flows in the Main Canal and dampen fluctuations in flow by constructing a 500-ac-ft regulating reservoir. The reservoir facilities will include a pump station on the Main Canal, an outlet control system, and flow volume instrumentation. This project is currently in the feasibility stage and is not expected to be completed during the duration of this RWMP. The project will potentially provide the following benefits:

- Regulate Main Canal flows to increase water supply reliability (TBs C-5, C-6, C-7, and C-8)

Targeted Benefits for this project are listed in Table 4-6.

5.8.5.2 Schedule

To be determined and documented in future updates to this RWMP.

5.8.5.3 Cost and Funding Sources

To be determined and documented in future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.8.6 RD 108 Strategic Plan for Groundwater Resources Characterization

5.8.6.1 Project Description

RD 108 performed a comprehensive review of past studies and data covering the area in and around the District, and a summary of the state of understanding of the groundwater system underlying the District was prepared. This information was used to identify opportunities for improving the understanding of the groundwater system, and to develop guidelines for further studies. The purpose of the Strategic Plan is to identify the approach the District should take to gain a better understanding of groundwater resources within the District and the constraints or limitations to utilizing the resource consistent with the Basin Management Plan Objectives set forth in the Groundwater Management Plan.

5.8.6.2 Schedule

The project was completed August 2009.

5.8.6.3 Cost and Funding

The cost for the Strategic Plan was $30,000 and was funded solely by RD 108.

Funding sources are listed in Table 4-7.

5.9 RD 108 Conjunctive Water Management Program

5.9.1 Project Description

The RD 108 proposes to develop a conjunctive water management program that will provide the flexibility to pump and convey groundwater in lieu of some of its surface water supply. Initially, RD 108 will develop a groundwater project with a project capacity of up to 8,000 ac-ft per year. Three groundwater production wells would be located within the service area near RD 108's existing canals. Additionally, existing groundwater monitoring wells would be retrofit with dataloggers. The production wells would likely have capacities that range from 2,000 to 3,500 gpm. The project originally called for five production wells, but was scaled down to three new groundwater wells given reduced grant funding availability. This project would help RD 108 meet the following objectives:

- Increase RD 108 water supply reliability and flexibility
- Increase in-stream flows during dry years
- Increase in-basin water supply reliability and flexibility
- Help satisfy the requirements of the Phase 8 Settlement Agreement

Targeted Benefits for this project are listed in Table 4-6.

5.9.2 Schedule

The project schedule shown in Table 5-9 will commence upon appropriation of funding.

TABLE 5-9
RD 108 Conjunctive Water Management Program Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Install Groundwater Monitoring Infrastructure	12 monitoring wells are currently installed by the Department, numerous multi-completion monitoring wells in Colusa and Yolo Counties
Pre-design	Complete
Groundwater Management Plan	Completed in 2006; update adopted November 2008
Environmental Document	Completed in 2010
Construction	Construction of three production wells will begin May 2012

	Project Duration – Work to be Completed											
	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Construction												
Implementation	→ For at least 10 years assuming there is no demonstrated impact to sustainability											

5.9.3 Cost and Funding Sources

The cost for the development of the RD 108 Conjunctive Water Management Program is estimated to be $1.4 million. RD 108 received public assistance to implement this program through the SVWMP and California State Proposition 50 Grants. The development and implementation of this program will be documented in future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.10 RD 108 Flow Control and Measurement Project

5.10.1 Project Description

RD 108 replaced flashboard checks with 23 long-crested weirs, one ITRC flap gate, and three Rubicon flume gates. Five acoustic velocity flowmeters were installed at strategic locations in the distribution canals, and approximately 80 farm turnouts were calibrated for improved flow measurement. The project improved water-level control and measurement, and provided simplified canal operation that resulted in approximately 2,000 ac-ft of water savings and $20,000 in pumping cost savings annually.

Targeted Benefits for this project are listed in Table 4-7.

5.10.2 Schedule

The project was completed December 2009.

5.10.3 Cost and Funding Sources

The total project cost for the RD 108 Flow Control and Measurement Project was $600,000. A Reclamation Water Use Efficiency Grant provided half of the cost.

Funding sources are listed in Table 4-7.

5.10.4 RD 108 Northern Area Groundwater Study

5.10.4.1 Project Description

This study will help characterize the groundwater system underlying the northern portion of the District and will include the following components:

- Inventorying wells within the area and compiling a database of this information
- Reviewing gas well geophysical logs and preparing a geologic cross section through the northern portion of the District
- Constructing a multiple-completion monitoring well near an existing production well
- Conducting aquifer testing, evaluating the data collected throughout the project
- Documenting all work and conclusions in a summary report

The information and understanding developed from this project will provide a technical basis for evaluating potential groundwater management actions and potential future projects in and around the northern portion of the District. Such projects could lead to increased flexibility in the source and timing of diversions.

5.10.4.2 Schedule

The project schedule is shown in Table 5-10A.

TABLE 5-10A
Northern Area Groundwater Study Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work											
	Project Duration – Work to be Completed											
	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Completed Inventory of Wells and Compiled Database												
Completed Geological Cross Section												
Completed Construction of Monitoring Wells												
Aquifer Testing to be completed by May 2012												
Report to be completed July 2012												

5.10.4.3 Cost and Funding Sources

Funding for this project was initially applied for under the AB 303 program; however, it was not accepted, and funding was approved under a Proposition 84 Grant. The total project cost is $276,000 with a District cost share of $31,000.

Funding sources are listed in Table 4-6.

5.10.5 RD 108 Recycled Water Improvement Project

5.10.5.1 Project Description

This project will increase the capacity of existing recycled water pump stations, resulting in conservation of both pumping energy and water diverted from the Sacramento River and a reduction of lower quality water pumped back to the river. Pumps and motors from three recently abandoned pump stations in the Sacramento River will be moved to the recycled water pump stations. Other improvements will include variable-frequency drives on certain recycled water pumps, flow measurement on pump discharges, and automation of turnouts delivering recycled water. It is estimated that this project will conserve 15,000 ac-ft/yr, reduce salinity of river return water by 15 percent, and reduce pumping costs by $80,000 per year. Actual water savings will be measured during the 2012 irrigation season.

5.10.5.2 Schedule

This project was completed February 2012.

5.10.5.3 Cost and Funding Sources

The total project cost for the RD 108 Recycled Water Improvement Project is estimated to be $1,200,000. A Proposition 50 Grant provided half of the cost.

Funding sources are listed in Table 4-7.

5.10.6 RD 108 Recycled Water Management Project

5.10.6.1 Project Description

This project improved the operations and management of three existing recycled water pump stations, resulting in conservation of both pumping energy and water diverted from the Sacramento River, and a reduction of lower quality water pumped back to the river. The improvements enhanced system performance by providing coordination and integration of recycled water pump stations with river diversions; providing remote monitoring and control of pump operations, water levels, and salinity levels; and preventing unscheduled pump shutdowns or pump damage from low water levels. Stilling wells were installed in the drains and canals for monitoring water levels, and salinity meters will be installed to help manage water quality. This project conserved 4,000 ac-ft/yr, reduced salinity of river return water by 4 percent, reduced pumping costs by $22,000 per year, and reduced operations cost by $5,000 per year.

5.10.6.2 Schedule

The project was completed December 2009.

5.10.6.3 Cost and Funding Sources

The total project cost for the RD 108 Recycled Water Management Project was $1,300,000. A Reclamation Water Conservation Field Services Grant provided $560,000.

Funding sources are listed in Table 4-7.

5.10.7 RD 108 Irrigation Scheduling

5.10.7.1 Project Description

This project will reduce both applied water and tailwater for a 10,000-acre area of non-rice crops by providing water users with scheduling information. It is estimated that this project will raise the average irrigation application efficiency from 62 to 70 percent, resulting in an annual conservation of approximately 5,500 ac-ft. Irrigation scheduling is an effective tool to help irrigators determine the timing and amount of each irrigation, thereby reducing the guesswork and tendency to over-irrigate. This project will use a computer program, called True Irrigation Scheduling Management (True ISM), that will generate weekly reports for irrigators. True ISM tracks the soil moisture for each field based on current CIMIS weather data, crop water use curves, effective root depths, and applied water data.

5.10.7.2 Schedule

The proposed schedule is as follows:

- Obtain software: COMPLETED
- Collect data: COMPLETED

- Set up True ISM: COMPLETED
- Conduct workshop with Irrigators: March 2012
- Begin sending weekly summary reports: April 2012

5.10.7.3 Cost and Funding

The total project cost for the RD 108 Irrigation Scheduling is $56,000. A Reclamation Water Conservation Field Services Grant provided $25,000.

Funding sources are listed in Table 4-7.

5.10.8 RD 108 Rice Water Conservation Program

5.10.8.1 Project Description

RD 108 began a creative incentive program in 2007 to help encourage farmers to reduce rice tailwater on the farm. RD 108's boundaries are surrounded by levees, and all tailwater and stormwater has to be pumped out of the District; therefore, actions to reduce drainage also reduce pumping and energy costs for the District. RD 108's Water Conservation Program compensates water users (through rebates) who take actions that help reduce District diversions or drainage water and the associated costs.

As part of the water conservation program, the District provides rice farmers with a notched board to place in the drainage riser when irrigators are maintaining water levels in the rice field. This program saves approximately 0.5 cfs or 1 ac-ft per day during the maintenance period. Rice farmers participating in this program receive an $8 per-acre rebate for the water and energy conserved.

Rice farmers that are able to eliminate all spill from their fields during the maintenance receive a rebate of $12 per acre. Since the start of the program the District has almost 100 percent participation from its rice growers.

5.10.8.2 Schedule

The project began in 2007 and is still in place. In 2011, use of the notched board in the drains became a mandatory practice. Farmers who do not use the notched board or spill over the top of the board are charged for the additional volume of water used to irrigate their crop. However, rebates are still available for rice farmers who completely eliminate tailwater from their rice fields during the maintenance season.

5.10.8.3 Cost and Funding

This project is funded through water rates by the growers. Growers who are able to demonstrate that they use less water are eligible for a rebate or refund that is based on the volume of water conserved.

Funding sources are listed in Table 4-7.

5.11 PCGID Conjunctive Water Management Program

5.11.1 Project Description

The PCGID proposes to develop a conjunctive water management program that will provide up to 5,000 ac-ft of groundwater supply that could be used in lieu of a similar quantity of diverted surface water. PCGID proposes using three existing, district-owned groundwater production wells or possibly installing two new district wells. Program goals include the following:

- Increase system reliability for in-basin users
- Increase system flexibility for in-basin users
- Contribute to satisfying the requirements of the Phase 8 Settlement Agreement

New wells would only be installed if the five existing wells that the PCGID has identified are determined insufficient to meet the needs of the program (e.g., production is low or there are air quality issues). PCGID has begun replacing the diesel motors on their groundwater wells with new electric motors to eliminate potential future air quality issues. To date, PCGID has replaced three diesel motors with electric motors. PCGID, as a participant in the Sacramento Valley Water Management Program, Glenn County groundwater management, and Colusa County groundwater management, is seeking to establish appropriate levels of groundwater monitoring for successful and responsible management of the groundwater resource.

Targeted Benefits for this project are listed in Table 4-6.

5.11.2 Schedule

The project schedule shown in Table 5-11 will commence upon appropriation of funding.

TABLE 5-11
PCGID Conjunctive Water Management Program Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Install Groundwater Monitoring Infrastructure	In progress; accomplished in conjunction with SVWMP, Glenn County, and Colusa County
Pre-design	In progress
Groundwater Management Planning	Ongoing since the late 1990s
Environmental Document	Not needed until wells have been approved

	Project Duration – Work to be Completed											
	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Final Design												
Permitting												
Construction												
Implementation	→ For at least 10 years assuming there is no demonstrated impact to sustainability											

5.11.3 Cost and Funding Sources

PCGID will fund the program with district monies. If PCGID decides to install new groundwater production wells instead of using existing wells, they will not seek public funding. The development and implementation of this program will be documented in future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.12 PID Conjunctive Water Management Program

5.12.1 Project Description

The PID proposes to develop a conjunctive water management program that will provide up to 5,000 ac-ft of groundwater supply that could be used in lieu of a similar quantity of diverted surface water. PID proposes using three existing, district-owned groundwater production wells or possibly installing two new district wells to help achieve the goals of the program, which include the following:

- Increase system reliability for in-basin users
- Increase system flexibility for in-basin users
- Contribute to satisfying the requirements of the Phase 8 Settlement Agreement

New wells would only be installed if the four existing wells that PID has identified are determined to not meet the needs of the program (e.g., production is low or there are air quality issues). PID has initiated work to convert existing diesel motors to electric motors to eliminate future air quality issues that might arise. To date, PID has replaced one diesel motor with an electric motor. PID, as a participant in the Sacramento Valley Water Management Program, Glenn County groundwater management, and Colusa County groundwater management, is seeking to establish appropriate levels of groundwater monitoring for successful and responsible management of the groundwater resource.

Targeted Benefits for this project are listed in Table 4-6.

5.12.2 Schedule

The project schedule shown in Table 5-12 will commence upon appropriation of funding.

TABLE 5-12
PID Conjunctive Water Management Program Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Install Groundwater Monitoring Infrastructure	In progress; accomplished in conjunction with SVWMP, Glenn County, and Colusa County
Pre-design	In progress
Groundwater Management Planning	Ongoing since late 1990s
Environmental Document	Not needed until wells have been approved

TABLE 5-12
PID Conjunctive Water Management Program Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work											
	Project Duration – Work to be Completed											
	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Final Design												
Permitting												
Construction												
Implementation	For at least 10 years assuming there is no demonstrated impact to sustainability											

5.12.3 Cost and Funding Sources

The PID will fund the program with district monies. If PID decides to install new groundwater production wells instead of using existing wells, they will not seek public funding. The development and implementation of this program will be documented in future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.13 Butte Sub-basin

Table 5-13 lists and describes potential projects in the Butte Sub-basin.

TABLE 5-13
Potential Projects in the Butte Sub-basin
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Title	District	Sub-basin	Description	Potential QO (ac-ft)	Applicable TBs
RD 1004 Canal Lining Project	RD 1004	Butte, Yuba	Extend canal lining on approximately 1.5 miles of the main canal; the first 0.5 mile of main canal is a lined channel which dumps into an unlined slough	3,500	BS-1, BS-4, FY-1, FY-4
RD 1004 Conjunctive Water Management Program	RD 1004	Butte, Yuba	Installation of two extraction wells	5,000	BS-1, BS-4, BS-5, BS-6, FY-1, FY-3, FY-5, FY-6
RD 1004 White Mallard Dam and Fish Ladder Replacement Project[a]	RD 1004	Butte, Yuba	Removed and replaced White Mallard Dam on Butte Creek and install weir and fish screen near Five-Points	17,000	BS-1, BS-5, BS-6, FY-3
RD 1004 Flowmeter Replacement Program[a]	RD 1004	Butte, Yuba	Upgrade analog turnout meters with digital meters	1,600	BS-1, BS-4, BS-5, BS-6, FY-1, FY-5, FY-6
RD 1004 Recirculation Pump 8 Rebuild Project[a]	RD 1004	Butte, Yuba	Redesigning and rebuilding Recirculation Pump 8	3,800	BS-1, BS-5, BS-6, FY-1

TABLE 5-13
Potential Projects in the Butte Sub-basin
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Title	District	Sub-basin	Description	Potential QO (ac-ft)	Applicable TBs
RD 1004 ITRC Water Gate Project[a]	RD 1004	Butte, Yuba	Install one self-adjusting check structure	70	BS-1, BS-4, FY-1
RD 1004 10-Foot by 8-Foot Weirs Installation Project[a]	RD 1004	Butte, Yuba	Installed two 10-foot by 8-foot weirs at the downstream end of RD 1004's main canal	1,200	BS-1, FY-1

[a]Project has been fully or partially implemented as described in the following sections.

5.14 RD 1004 Canal Lining Project

5.14.1 Project Description

This project is expected to conserve an estimated 10 to 15 percent of RD 1004's diverted surface water (approximately 5,600 to 8,400 ac-ft/yr). The project would promote water conservation by extending the lined portion of the RD 1004 Main Canal by approximately 1.5 miles. This project is the next phase of a traditional water use efficiency program started by RD 1004 in the late 1990s, when they lined approximately 0.5 mile of the uppermost portion of the Main Canal.

The RD 1004 Main Canal is subject to considerable conveyance losses through seepage, resulting in delivery inefficiencies. RD 1004 estimates that it currently loses as much as 60 cfs (the equivalent production of one pump) through the upper reaches of its Main Canal.

Targeted Benefits associated with this project are listed in Table 4-6.

5.14.2 Schedule

The project schedule shown in Table 5-14 will commence upon appropriation of funding.

TABLE 5-14
RD 1004 Canal Lining Project Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Phase 1 – New Diversion and Canal Lining	Completed
Environmental Document	To commence upon funding; supplemental documentation (to be identified in the environmental impact report or environmental impact statement) might be required during final design

Project Duration – Work to be Completed

	Year 1				Year 2				Year 3			
Quarter	1	2	3	4	1	2	3	4	1	2	3	Q4
Final Design	■	■										
Permitting and Environmental	■	■	■									
Construction			■	■	■	■	■	■	■	■	■	
Potential Mitigation	● →											

If mitigation for sensitive habitat or species is identified, mitigation monitoring might be required for up to 3 years.

5.14.3 Cost and Funding Sources

The cost for the development of the RD 1004 Canal Lining Project is estimated to be $3 million. The cost estimate will be refined during the final design. RD 1004 is seeking public assistance to implement this program through the SVWMP and California State Proposition 50 Grants. The development and implementation of this program will be documented in future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.15 RD 1004 Conjunctive Water Management Program

5.15.1 Project Description

RD 1004 proposes to develop a conjunctive water management program that will provide up to 5,000 ac-ft of groundwater supply that could be used in lieu of a similar quantity of diverted surface water. The RD 1004 would install two groundwater production wells, with capacities estimated between 2,500 and 4,500 gpm, to help achieve the goals of the program, which include the following:

- Increase system reliability for in-basin users
- Increase system flexibility for in-basin users
- Contribute to satisfying the requirements of the Phase 8 Settlement Agreement

RD 1004, as a participant in the Sacramento Valley Water Management Program, is seeking to establish appropriate levels of groundwater monitoring for successful and responsible management of the groundwater resource.

With assistance from Ducks Unlimited, RD 1004 seeks to drill four deep water production wells and two monitoring wells capable of supplementing District surface water.

Targeted Benefits associated with this project are listed in Table 4-6.

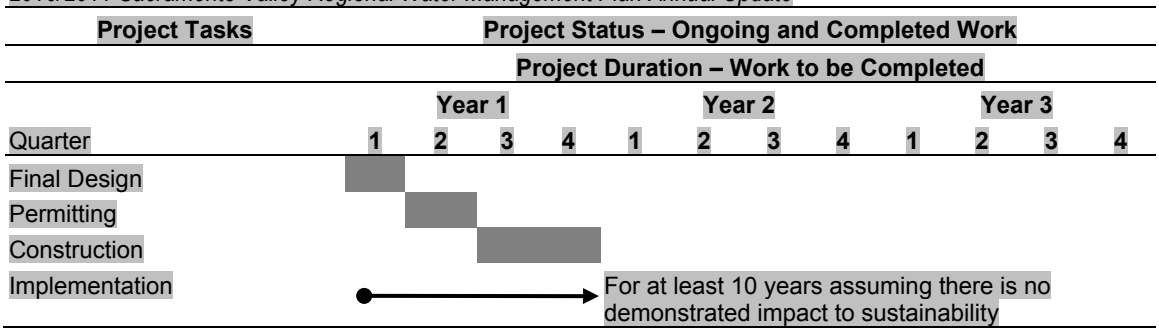
5.15.2 Schedule

The project schedule shown in Table 5-15 will commence upon appropriation of funding.

TABLE 5-15
RD 1004 Conjunctive Water Management Program Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Identification of Appropriate Groundwater Monitoring Locations	In progress; accomplished in conjunction with the SVWMP
Pre-design	In progress
Groundwater Management Planning	Ongoing; accomplished in conjunction with the District and the counties
Four new production wells	Estimated to be installed in 2013
Environmental Document	In progress; to be completed in 2013

TABLE 5-15
RD 1004 Conjunctive Water Management Program Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update



5.15.3 Cost and Funding Sources

The cost for the development of the RD 1004 Conjunctive Water Management Program is estimated to be $1 million. RD 1004 is seeking public assistance to implement this program through the SVWMP and California State Proposition 50 Grants. The development and implementation of this program will be documented in future updates to this RWMP.

Funding is underway for the four new production wells through Ducks Unlimited, who would pay the project capital costs, estimated at $4 million. RD 1004 will maintain and operate the wells at their own expense.

Funding sources are listed in Table 4-6.

5.15.4 RD 1004 White Mallard Dam and Fish Ladder Replacement Project and Five-Points Project

5.15.4.1 Project Description

The first phase of this project removed and replaced White Mallard Diversion Dam on Butte Creek, a tributary to the Sacramento River. The new dam provides a steady flow down a fish ladder, improving fish passage while more efficiently diverting water to RD 1004. This project improves fish passage, provides greater diversion flexibility, and leaves an estimated 17,000 ac-ft of water in the Sacramento River each year.

The second phase, the Five-Points Project, will install a weir and fish screen, and be the final phase of a current plan to further enhance water delivery capabilities and protect fish and fish passage through the Butte Creek corridor. SCADA telemetry including measurement instrumentation will also be installed. The new SCADA would tie upstream projects together and balance creek elevations to benefit fish and District needs.

Targeted Benefits for this project are shown in Table 4-7.

5.15.4.2 Schedule

The project schedule is shown in Table 5-15A.

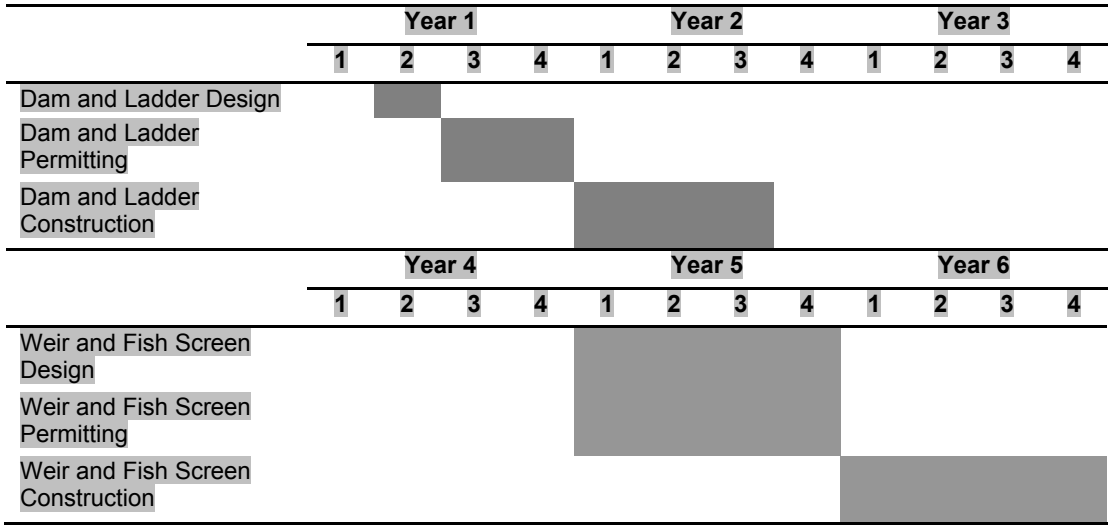
TABLE 5-15A

RD 1004 White Mallard Dam and Fish Ladder Replacement Project Schedule

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Dam and Ladder Engineering Design	Completed in February 2004
Dam and Ladder Environmental Document	Completed in February 2004
Dam and Ladder Construction	Completed in October 2007
Weir and Fish Screen Engineering Design	To commence upon funding
Weir and Fish Screen Environmental Document	To commence upon funding
Weir and Fish Screen Construction	To commence upon funding

Project Duration – Work to be Completed



5.15.4.3 Cost and Funding Sources

The project is funded by Ducks Unlimited at a cost of $5.4 million ($1.4 million for the dam replacement and $4 million for the Five-Points Project). The $65,000 cost of a new SCADA system is included in the $5.4 million estimate. RD 1004 purchased right-of-way and surveying services at a cost to the district of $25,000.

Funding sources are listed in Table 4-7.

5.15.5 RD 1004 Flowmeter Replacement Program

5.15.5.1 Project Description

In 1992, RD 1004 installed propeller meters to measure flow on every turnout in their district. These meters started to break down as moving parts got split and worn. Annual maintenance became so expensive and time consuming that RD 1004 decided in 2001 to slowly replace the analog meters with digital ones. The new digital meters require

significantly less maintenance and allow RD 1004 to keep up their practice of measuring and charging for water at the turnout level.

Updating the analog meters with the digital meters saves an estimated 1 to 2 percent of total diversions, estimated around 1,600 ac-ft per year.

Targeted Benefits for this program are listed in Table 4-7.

5.15.5.2 Schedule

The project schedule is shown in Table 5-15B.

TABLE 5-15B
RD 1004 Flowmeter Replacement Program Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Installation of Turnout Meters	Completed around 1992
Upgrade of Turnout Meters	In progress; to be completed on an as-needed basis

	Project Duration – Work to be Completed											
	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Installation of Turnout Meters												
Upgrade of Turnout Meters												

5.15.5.3 Cost and Funding Sources

Installing the original flowmeters around 1992 was paid for by the individual farmers at a cost of approximately $900 to $1,200 per turnout. RD 1004 has since paid for all maintenance, including the upgrades from analog to digital meters. Upgrading one meter costs roughly $500. With 135 meters in service, the total cost of upgrading all meters is approximately $67,500.

Operating the flowmeters requires significant maintenance costs, and even the digital low maintenance meters cost approximately $50 every year to keep running.

Funding sources are listed in Table 4-6.

5.15.6 RD 1004 Recirculation Pump 8 Rebuild Project

5.15.6.1 Project Description

This project includes redesigning and rebuilding Recirculation Pump 8, enhancing pump and sump efficiencies and allowing for higher recycled water flows. The pump is located in one of several key northern areas where drain water can be picked up and placed into a high-line delivery canal, reducing the need to pump additional water from the Sacramento River. The project also includes the installation of a new doplar flowmeter to accurately measure recycled water. Pump improvements result in an estimated water savings of 3,800 ac-ft.

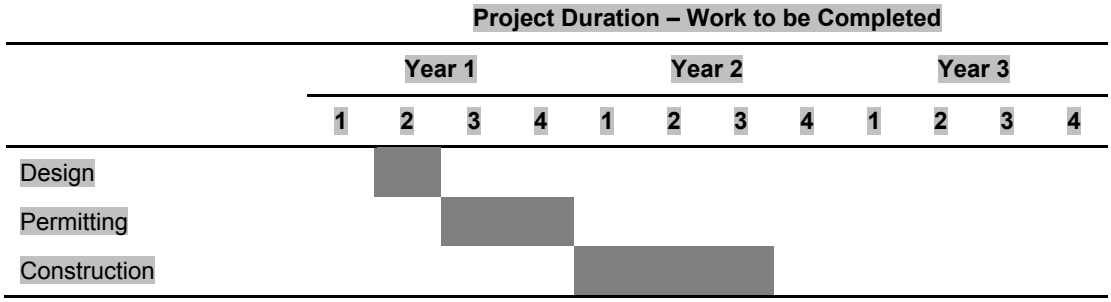
Targeted Benefits for this project are shown in Table 4-7.

5.15.6.2 Schedule

The project schedule is shown in Table 5-15C.

TABLE 5-15C
Recirculation Pump 8 Rebuild Project Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Redesign and Rebuild Recirculation Pump 8	Completed January 2009
Install Doplar Meter	To be installed in fall 2012



5.15.6.3 Cost and Funding Sources

The cost of rebuilding the pump is $60,000, and the cost of the doplar meter is $3,200. RD 1004 will pay for the entirety of this $63,200 project.

Funding sources are listed in Table 4-7.

5.15.7 RD 1004 ITRC Water Gate Project

5.15.7.1 Project Description

Cal Poly has developed a fully mechanical check structure that automatically adjusts to water flow to maintain constant canal elevation upstream of itself. RD 1004 is participating in this program through Cal Poly and will install one gate in their system.

This gate will provide greater system control, thereby improving water management and saving an estimated 70 ac-ft of water.

Targeted Benefits for this project are shown in Table 4-7.

5.15.7.2 Schedule

Design was completed by Cal Poly as part of the program. The gate was installed and operational during fall 2009.

5.15.7.3 Cost and Funding Sources

The gate is provided through the ITRC program, which is funded by Reclamation. The installation cost, including the cost of the abutments that support the gate, is approximately $3,300, paid for by the District.

Funding sources are listed in Table 4-7.

5.15.8 RD 1004 10-Foot by 8-Foot Weirs Installation Project

5.15.8.1 Project Description

This project installed two 10-foot by 8-foot weirs at the downstream end of RD 1004's main canal. The weir raises water levels on their downstream side serving two primary purposes. Firstly, the high water surface diverts water through a new 84-inch screwgate turnout structure, also installed as part of this project. Secondly, the weirs allow the canal to remain full during winter floods. When kept full, the weight of the water in the canal counteracts the uplift force caused by high groundwater tables. Pervious soils and high water tables have caused significant damage to the canal lining since it was built in 1998. This damage results in significant seepage estimated at 1,200 ac-ft/yr.

Targeted Benefits for this project are shown in Table 4-7.

5.15.8.2 Schedule

Design for this project was completed by the weir manufacturer and RD 1004. The weir boxes took several weeks to fabricate and were installed in 4 days.

5.15.8.3 Cost and Funding Sources

The project was funded through a Reclamation grant from 1997. Most of this grant was used to pay for a District pumping plant, and a portion of the remainder was used to pay for the weir installation project. The cost of the weir and screwgate was approximately $30,000.

Funding sources are listed in Table 4-7.

5.16 Sutter Sub-basin

Table 5-16 lists and describes potential projects in the Sutter Sub-basin.

TABLE 5-16
Potential Projects in the Sutter Sub-basin
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Title	District	Sub-basin	Description	Potential QO (ac-ft)	Applicable TBs
MFWC Conjunctive Water Management Program	MFWC	Sutter	Installation of one groundwater production well	1,000	BS-1, BS-5, BS-6
MFWC Conjunctive Water Management Program[a]	MFWC	Sutter	Installation of two groundwater production wells	1,500	BS-1
MFWC Phase 2 Fish Screen Project	MFWC	Sutter	Phase II Fish Screen	TBD	BS-1
SMWC Irrigation Recycling Project	SMWC, PMWC, and RD 1500	Sutter	Feasibility analysis of a tailwater recovery system	25,000	BS-1, BS-5, BS-6
SMWC, PMWC and RD 1500 Joint Sutter Basin Drainwater Reuse Project	SMWC, PMWC, and RD 1500	Sutter	Feasibility study identifying alternatives for expansion of the existing drainwater reuse system	5,000	BS-1, BS-5, BS-6
SMWC Canal Lining	SMWC	Sutter	Canal lining to reduce diversions and eliminate spills	1,000	BS-1, BS-4
SMWC, PMWC, and RD 1500 Joint Sutter Basin Groundwater Management Program	SMWC, PMWC, and RD 1500	Sutter	Groundwater investigation; installation of 12 monitoring wells and 6 production wells	5,000	BS-1, BS-5, BS-6

5.17 MFWC Conjunctive Water Management Program

5.17.1 Project Description

MFWC proposes to develop a conjunctive water management program that will provide groundwater supply that could be used in lieu of a similar quantity of diverted surface water. In spring 2009, MFWC installed two groundwater wells. These two wells are expected to yield 1,500 ac-ft annually. MFWC is preparing to install one additional groundwater production well in 2012, with an estimated capacity of 3,500 gpm to help achieve the goals of the program, which include the following:

- Increase system reliability for in-basin users
- Increase system flexibility for in-basin users
- Contribute to satisfying the requirements of the Phase 8 Settlement Agreement

The MFWC, as a participant in the Sacramento Valley Water Management Program and through Sutter County is seeking to establish appropriate levels of groundwater monitoring for successful and responsible management of the groundwater resource.

Targeted Benefits for this project are listed in Table 4-6.

5.17.2 Schedule

The project schedule shown in Table 5-17 will commence upon appropriation of funding.

TABLE 5-17
MFWC Conjunctive Water Management Program Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Groundwater Management Planning	Ongoing; accomplished in conjunction with Sutter County and the Department
Preliminary Design	Completed; spring 2011
Environmental Document	Completed; fall 2011

	Project Duration – Work to be Completed											
	Year 1				Year 2				Year 3			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Final Design												
Permitting												
Construction												
Implementation	For at least 10 years assuming there is no demonstrated impact to sustainability											

5.17.3 Cost and Funding Sources

The cost for the development of the MFWC Conjunctive Water Management Program is estimated to be $755,500. MFWC received public assistance to implement this project through the SVWMP and California State Proposition 50 Grants. Construction is anticipated to begin in July 2012 and is expected to be completed by end of summer 2012. The

development and implementation of this program will be documented in the future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.17.4 MFWC Phase 2 Fish Screen Project

5.17.4.1 Project Description

The Phase 2 Fish Screen Project consists of demolition of the existing Drexler Diversion, construction of the Drexler Relift Pump Station, modifications to the Main Canal and Grimes Canal, and other canal modifications.

Targeted Benefits for this project are listed in Table 4-6.

5.17.4.2 Schedule

The project schedule is shown in Table 5-17A.

TABLE 5-17A
MFWC Phase 2 Fish Screen Project Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Design	Completed in October 2011
Environmental and Permitting	Anticipated to be completed in fall 2012
Construction	Solicit bids in summer 2012 and begin construction in fall 2012 after irrigation deliveries are completed

Project Duration – Work to be Completed

5.17.4.3 Cost and Funding Sources

The estimated cost of this project, $18,200,000, includes environmental mitigation, engineering, legal, rights-of-way, construction management, and construction. Construction of the fish screen at the Meridian site is being funded by the AFSP program (50 percent from the U.S. Bureau of Reclamation and 50 percent from the California Department of Fish and Game).

Funding sources are listed in Table 4-6.

5.18 SMWC, PMWC, and RD 1500 Joint Sutter Basin Drainwater Reuse Project

5.18.1 Project Description

SMWC, in conjunction with Reclamation District No. 1500 (RD 1500) and Pelger Mutual Water Company, is conducting a feasibility study that is identifying alternatives for expansion of the existing drainwater reuse system and the costs associated with the increased recapture. An enhanced drainage recapture program would enhance and optimize the use of applied surface water for irrigation purposes and minimize summer drainage that must be pumped out of the Sutter Basin. The project could require construction of check structures, modification of existing canals, and installation of new lift pumps within RD 1500 and SMWC.

The study was completed in 2009, and could be implemented pending the availability of public funds for implementation. The Department funded the study through the WUE. Initial estimates of potential increased drainwater reuse are on the order of 5,000 to 15,000 ac-ft annually. Actual increased reuse capacity will depend on the selected preferred alternative and available water supply (e.g., water-year type).

Targeted benefits for this project are listed in Table 4-6.

5.18.2 Schedule

The project schedule shown in Table 5-18 will commence upon appropriation of funding.

TABLE 5-18
SMWC and RD 1500 Joint Sutter Basin Drainwater Reuse Project Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Reconnaissance Investigation	Completed
Feasibility Study	Completed

Project Duration – Work to be Completed												
	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Design												
Environmental Documentation and Permitting												
Construction												

5.18.3 Cost and Funding Sources

The feasibility study was partially funded by the Department through WUE for approximately $182,000. Upon completion of the study, a monitoring plan will need to be developed and implemented for pre-project development and post-project reporting. An additional $200,000 is estimated for completion of pre-design. An order-of-magnitude cost estimate for design and construction of the project will be developed as part of the study.

The cost estimate will be refined during the final design. To conduct the pre-design, SMWC and its basin partners are seeking funds from state and federal sources in addition to working with the Sacramento Valley Water Management Program. Indications point to the economic and technical viability of this project, and the project partners will continue to pursue funds for the implementation of the entire project after a cost estimate has been completed as part of the current study effort. The development and implementation of this program will be documented in future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.19 SMWC Canal Lining Project

5.19.1 Project Description

SMWC proposes lining approximately 1.3 miles of its lateral system. This project is expected to conserve 500 to 1,000 ac-ft of water per year. The canal lining would include one 0.6-mile section along Lateral F and one 0.7-mile section along Lateral D. Both of these sections are currently subject to significant seepage and annual bank failures.

Targeted Benefits for this project are listed in Table 4-6.

5.19.2 Schedule

The project schedule shown in Table 5-19 will commence upon appropriation of funding.

TABLE 5-19
SMWC Canal Lining Project Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work											
Environmental Document	To commence upon funding											
	Project Duration – Work to be Completed											
	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Design												
Permitting												
Construction												

5.19.3 Cost and Funding Sources

The cost for the development of the SMWC Canal Lining Project is estimated to be $350,000. The cost estimate will be refined during the final design. SMWC is seeking public assistance to implement this program through the SVWMP and California State Proposition 50 Grants. The development and implementation of this program will be documented in future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.20 SMWC, PMWC, and RD 1500 Joint Sutter Basin Groundwater Management Program

5.20.1 Project Description

SMWC, in partnership with RD 1500 and PMWC, proposes installing six groundwater production wells with an estimated capacity of 1,000 to 1,500 gpm, pumped over a 153-day period. This project is expected to provide a maximum annual contribution of 5,000 ac-ft of water supply. Also installed as part of this project would be six multi-completion groundwater monitoring wells. This project would help SMWC meet the following objectives:

- Increase SMWC water supply reliability and flexibility
- Increase in-stream flows during dry years
- Increase in-basin water supply reliability and flexibility
- Contribute to satisfying the requirements of the Phase 8 Settlement Agreement

Targeted Benefits for this project are listed in Table 4-6.

5.20.2 Schedule

The project schedule shown in Table 5-20 will commence upon appropriation of funding.

TABLE 5-20
SMWC, PMWC, and RD 1500 Joint Sutter Basin Groundwater Management Program Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Pre-design	Completed
Groundwater Management Planning	Ongoing; accomplished in conjunction with RD 1500, PMWC, SVWMP, and Sutter County
Environmental Document	To commence upon funding

	Project Duration – Work to be Completed											
	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Install Groundwater Monitoring Infrastructure	This task will be ongoing as additional monitoring infrastructure is continually installed; the first priority will be the six monitoring wells associated with the proposed 5,000-ac-ft project.											
Final Design												
Permitting												
Construction												
Implementation	→ For at least 10 years, assuming there is no demonstrated impact to sustainability											

5.20.3 Cost and Funding Sources

The cost for the development of the program is estimated to be $5 million. SMWC is seeking public assistance to implement this program through the SVWMP and California State

Proposition 50 Grants. The development and implementation of this program will be documented in future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.21 PMWC Conjunctive Water Management Program

This project has been removed because PMWC is no longer participating in this RWMP Annual Update.

5.21.1 Project Description

5.21.2 Schedule

5.21.3 Cost and Funding Sources

5.21.4 PMWC Canal Lining Project

This project has been removed because PMWC is no longer participating in this RWMP Annual Update.

5.21.4.1 Project Description

5.21.4.2 Schedule

5.21.4.3 Cost and Funding Sources

5.22 American Sub-basin

Table 5-22 lists and describes potential projects in the American Sub-basin.

TABLE 5-22
Potential Projects in the American Sub-basin
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Title	District	Sub-basin	Description	Potential QO (ac-ft)	Applicable TBs
NCMWC Conjunctive Use Project	NCMWC	American	Utilization of existing groundwater production wells, monitoring and analyzing results	15,000	A-1, A-4, A-5, A-6
NCMWC American Basin Fish Screen and Habitat Improvement Project – Sankey Diversion	NCMWC	American	Install new pump station and fish screen on Sacramento River	1,400	A-1, A-4, A-5, A-6
NCMWC SCADA Project for the Natomas Basin[a]	NCMWC	American	Improve flow monitoring in Natomas Basin	4,500	A-1, A-4, A-5, A-6

[a]Project has been fully or partially implemented as described in the following sections.

5.23 NCMWC Conjunctive Water Management Program

5.23.1 Project Description

NCMWC proposes to develop a conjunctive water management program that would provide the flexibility to pump and convey groundwater in lieu of some of its surface water supply. This program would be implemented in phases. The initial phase would involve installation of six new wells and installation and upgrade of the infrastructure to connect the new wells and 13 existing wells to NCMWC's conveyance system. The proposed production wells would likely have capacities that range from 2,500 to 3,500 gpm. This project would help NCMWC meet the following objectives:

- Increase Company water supply reliability and flexibility
- Increase in-stream flows during dry years
- Increase in-basin water supply reliability and flexibility
- Help meet the requirements of the Phase 8 Settlement Agreement

Targeted Benefits associated with this program are listed in Table 4-6.

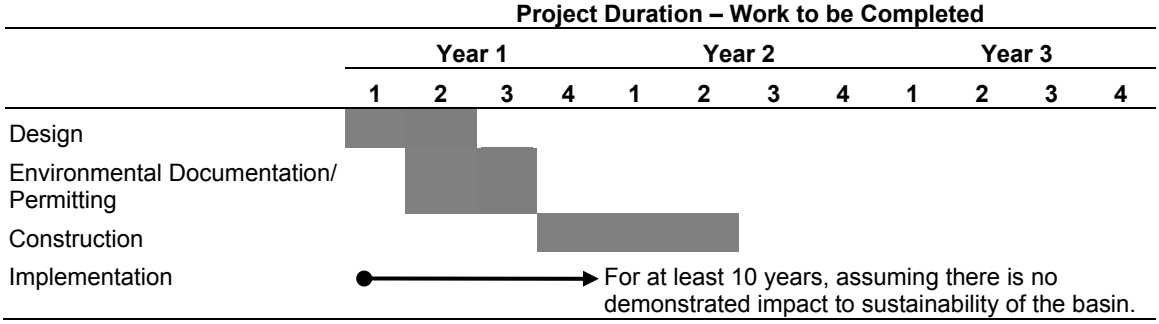
5.23.2 Schedule

The project schedule shown in Table 5-23 will commence upon appropriation of funding.

TABLE 5-23
NCMWC Conjunctive Water Management Program Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing/Completed Work
Groundwater Management Planning and Monitoring	Ongoing
Environmental Document	In progress; to be completed by spring 2010; supplemental documentation might be required

Project Duration – Work to be Completed



5.23.3 Cost and Funding Sources

The cost for the development of the NCMWC Conjunctive Water Management Program would be approximately $5 million. NCMWC is seeking public funding to help implement this program through the SVWMP and state and federal agencies. The development and implementation of this program will be documented in future updates to this RWMP.

Funding sources are listed in Table 4-6.

5.23.4 NCMWC American Basin Fish Screen and Habitat Improvement Project – Sankey Diversion

5.23.4.1 Project Description

This project involves the construction of a new 434-cfs pump station on the Sacramento River near Sankey Road. Each of the five pumps in the station will independently draw water through a positive-barrier fish screen, pump the water over the levee, and discharge it into the proposed new Sankey Highline Canal.

NCMWC's current system raises the water surface in the Natomas Cross Canal to draw water through two existing pumping plants. This canal runs into the Sacramento River approximately 1,000 feet upstream of the proposed pumping plant. The increase in efficiency from replacing the existing diversion system with the single new facility would save 1,400 ac-ft of water annually.

Targeted Benefits associate with this project are listed in Table 4-6.

5.23.4.2 Schedule

The project schedule is shown in Table 5-23A.

TABLE 5-23A
NCMWC American Basin Fish Screen and Habitat Improvements Project – Sankey Diversion Schedule
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Project Tasks	Project Status – Ongoing and Completed Work
Engineering Design	Completed early 2009
Environmental Document	Completed winter 2009
Construction	Started in spring 2010

	Project Duration – Work to be Completed											
	Year 1				Year 2				Year 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Design												
Permitting												
Construction												

5.23.4.3 Cost and Funding Sources

Approximately $1.5 million have been received from CALFED and Reclamation for design and permitting. NCMWC has cooperative agreements with CDFG, CALFED, and Reclamation for the remaining $44 million to build the Sankey Diversion Facilities. The development of this project will be documented in future updates to the RWMP.

Funding sources are listed in Table 4-6.

5.23.5 NCMWC SCADA Project for the Natomas Basin

5.23.5.1 Project Description

This project proposes to install and operate a SCADA system in the Natomas Basin. SCADA would continuously collect flow data at selected locations to better direct the flow of

irrigation water throughout the basin. The system would extend beyond NCMWC boundaries to include neighboring Reclamation District 1000 (RD 1000). Benefits include increased public safety, reduced power use, and increased water savings, estimated at 4,000 to 5,000 ac-ft/yr.

5.23.5.2 Schedule

This project is being conducted in phases consisting of funding and construction. Phase 1a is funded and currently under construction. Phase 1b is funded and waiting the completion of Phase 1a. Phase 2a is planned and currently waiting funding. A grant request for Phase 2a has been submitted. Additional phases will be added as funding becomes available.

5.23.5.3 Cost and Funding Sources

NCMWC applied for project funding through the Proposition 50 WUE Grant in 2007. The total estimated cost for this project is $350,000. The grant awarded $163,000, and NCMWC paid the remaining $187,000.

Funding sources are listed in Table 4-7.

SECTION 6.0

Establishment of Monitoring Program

Section 6.0 revisions to the RWMP are highlighted below in shaded text. Revisions to Section 6.0 were focused on updating the Sacramento Valley Water Quality Coalition water quality monitoring activities and the proposed baseline flow determination approach.

This section documents the current water quality and flow measurement capabilities of each participating SRSC and proposes a plan to monitor progress in satisfying QOs resulting from the implementation of water projects. As described in Section 4.0 of this document, QOs were developed by evaluating and identifying the potential quantity of water that could potentially be made available given the implementation of various projects considered to be feasible. Monitoring the performance of each project will be guided by the development of project-specific performance and monitoring plans, including mapping monitoring locations. The primary method of monitoring a project's contribution to a QO is flow measurement at the diversion point on the Sacramento River. SRSCs currently monitor their diversions during specific periods. Changes to river diversions can be quantified and compared with similar water years, including changes in the timing of diversions. It is proposed that baseline flows be identified using recent and historical diversion records by year type, and that future monitoring use a combination of diversion measurement and projected water made available in mutual agreement between the project proponent and Reclamation.

As identified in the RWMP, the status of baseline and monitoring development and mapping will be documented in each RWMP annual update. As summarized in Section 2.0, a number of projects have been proposed for implementation but have not yet been funded. Smaller scale projects have been implemented directly by some districts using district funds.

System improvement projects proposed to date have included system automation, new gates and ramp flumes, measurement devices, recycling programs, pipe or canal lining, and regulatory reservoirs. Reducing conveyance leakage through the lining of canals or installation of pipelines results in decreased transportation loss and/or percolation. Projections have been made for such projects, but identifying actual savings will need to be quantified by comparing pre-project and post-project data. Methods would include seepage and/or ponding tests. It is recommended that the agreed upon measurement approach be tailored to the specific project incorporated as part of the initial phases of implementation as recommended in the RWMP.

It is important to recognize that such projects result in either reduced "losses" or a reduction in tailwater. In many areas it is neither practical nor advisable to eliminate all tailwater, as it is often reused either within a district or by an adjoining district (particularly in the Colusa Sub-basin) as a source of supply. Thus, the water made available to meet a given QO should be evaluated with respect to total sub-basin water use and demand as appropriate. The "optimum" tailwater flow is influenced by many factors including hydrology, cropping

patterns, and individual cultural farming practices. In 2003, the SRSCs conducted the Sub-basin-level Water Measurement Study, which included the following objectives:

- Investigate and document the existing sub-basin outflow water measurement facilities
- Evaluate and recommend facility improvements to achieve higher levels of accuracy and/or data collection if deemed appropriate
- Provide cost estimates for recommended measurement facility improvements
- Identify potential issues of implementing a regional approach to water measurement operations, data collection, and use
- Identify the potential benefits of improved sub-basin-level water measurement

Among the recommendations from this study was that outflow measurement be conducted at specific locations in the Colusa, American, Butte, and Sutter Sub-basins to improve the understanding of the quantity and timing of sub-basin outflow. Specific monitoring locations were identified, as well as recommended measurement approach, equipment needs, and associated costs. An initial 2-year phase of the program was recommended, but was not subsequently funded. The SRSCs and the Northern California Water Association (NCWA) continue to seek funding and promote this measurement and monitoring effort. As summarized in the RWMP, the SRSCs intend to work with the Department to purchase and install equipment and calibrate new and existing measuring devices to improve outflow measurement accuracy in these sub-basins. Continuation of this effort, as well as the Cooperative Water Management Study summarized below, will provide useful information and data to assist in the implementation of an overall water measurement program. The program will meet the requirements of regional criteria, improve the understanding of quantity and timing of inflows and outflows at various levels of SRSC agricultural water operations, and provide information necessary to monitor benefits consistent with CALFED QOs.

6.1 Cooperative Study Update

The August 2010 *Cooperative Water Measurement Study Report* identifies issues related to measurement at the various levels (for example, lateral and farm-level) and provides recommendations regarding current measurement practices and areas for additional study that will require additional funding. The SRSCs acknowledge the regional and standard criteria regarding water measurement, including the requirement to develop a mutually agreeable surface water delivery water measurement program consistent with those conservation and efficiency criteria. To that end, the SRSCs, in cooperation with Reclamation, conducted the Cooperative Measurement Study to evaluate the benefits and costs associated with measurement of agricultural deliveries at various levels (that is, turnout level, lateral level, and district or company level). In addition, recent and related criteria imposed by the state of California Department of Water Resources including SBx7-7 require additional assessment and understanding before individual SRSCs commit to a specific measurement program for their particular district. For example, RD 108 is currently pilot testing water measurement options including orifice gates and precast weir boxes. Other districts are employing other approaches toward lateral or farm-level measurement, as appropriate, for their individual district facilities and primary crop needs.

6.2 Water Quality and the Sacramento Valley Water Quality Coalition

The Sacramento Valley Water Quality Coalition (Coalition) was formed in 2003, to enhance and improve water quality in the Sacramento River, while sustaining the economic viability of agriculture, functional values of managed wetlands, and sources of safe drinking water. The Coalition is composed of more than 8,600 farmers and wetlands managers encompassing more than 1.1 million irrigated acres and supported by local farm bureaus, resource conservation districts, County Agricultural Commissioners, and crop specialists with the University of California Cooperative Extension to improve water quality for Northern California farms, cities, and the environment.

The Coalition developed and submitted its Regional Plan for Action to the State Water Resources Control Board and the Central Valley Regional Water Quality Control Board (Water Board) in June 2003. To implement the Regional Plan for Action and to meet the Water Board's Irrigated Lands Regulatory Program (ILRP), the Coalition prepared and submitted a revised Monitoring and Reporting Program Plan (MRPP) on July 25, 2008 (the initial MRPP was submitted in April 2004 and remained in effect through 2008). To effectively implement the MRPP, the Coalition and 12 sub-watershed groups signed a Memorandum of Agreement that defines the respective roles and responsibilities of the sub-watershed groups, as well as the Northern California Water Association. Additionally, the Coalition signed a Memorandum of Agreement with the California Rice Commission to coordinate the respective water quality programs in the Sacramento River Basin. Although water districts are typically not direct members of the Coalition, many districts and companies have encouraged landowners to join and have assisted in grower education through newsletters and information updates. The Coalition is continuing to pursue partnerships with municipalities and urban areas in the region that are developing stormwater management plans and facing increasingly more stringent effluent limitations.

Figure 6-1 shows the sites that were monitored during 2005 through 2010 (Central Valley Board monitoring data for the Sacramento Valley are available at: http://www.swrcb.ca.gov/centralvalley/water_issues/irrigated_lands/monitoring/monitoring_data/program_participants/index.shtml#svc).

Development of the amended MRPP allowed the Coalition to re-evaluate the waterways, identify drainages with the highest and most inclusive agriculture, and use water quality data from those sites to represent other similar areas. On the basis of the results collected by the Coalition to date, the Coalition proposed a much more focused monitoring program. Similarly, the Coalition proposed to conduct more focused monitoring of most trace elements (arsenic, cadmium, lead, nickel, selenium, and zinc) given monitoring to date has demonstrated that these metals do not exceed objectives and are not likely to cause adverse impacts to aquatic life or human health in waters receiving agricultural runoff in the Coalition watershed. In December 2009, the Water Board approved a 5-year specific MRPP that focuses on surface water quality monitoring and analysis of the pesticides, herbicides, nutrients, and other agricultural products specifically used locally in the sub-watersheds of the Sacramento Valley. Starting in 2009, the Coalition began monitoring 21 semi-permanent sites; see Table 6-1. Additional sites that have management plan requirements were also monitored. In 2011, the Coalition conducted broad-based assessment monitoring at its

21 monitoring sites. Additional targeted monitoring is conducted for specific water quality parameters. The annual monitoring reports are available for review.

TABLE 6-1
2009 Sacramento Valley Coalition Monitoring
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Sub-watershed	Location	Lat	Long
Butte-Sutter-Yuba	Lower Honcut Creek at Highway 70	39.30915	-121.59542
Butte-Sutter-Yuba	Butte Slough at Pass Road	39.1873	-121.90847
Butte-Sutter-Yuba	Gilsizer Slough at George Washington Road	39.009	-121.6716
Butte-Sutter-Yuba	Lower Snake River at Nuestro Road	39.18531	-121.70358
Butte-Sutter-Yuba	Wadsworth Canal at South Butte Road	39.15337	-121.73435
Colusa Glenn	Walker Creek near 99W and CR33	39.62423	-122.19652
Colusa Glenn	Colusa Basin Drain above KL	38.8121	-121.7741
Colusa Glenn	Rough and Ready Pumping Plant (RD 108)	38.86209	-121.7927
Lake-Napa	Middle Creek upstream from Highway 20	39.17641	-122.91271
Lake-Napa	Pope Creek upstream from Lake Berryessa	38.64637	-122.36424
Solano-Yolo	Shag Slough at Liberty Island Bridge	38.30677	-121.69337
Butte-Sutter-Yuba	Lower Snake River at Nuestro Road	39.18531	-121.70358
Butte-Sutter-Yuba	Sacramento Slough Bridge near Karnak	38.785	-121.6533
Butte-Sutter-Yuba	Pine Creek at Nord Gianella Road	39.78114	-121.98771
Colusa Glenn	Freshwater Creek at Gibson Road	39.17664	-122.18915
El Dorado	North Canyon Creek	38.7604	-120.7102
Pit River	Pit River at Pittville	41.0454	-121.3317
PNSNSS	Coon Creek at Brewer Road	38.93399	-121.45184
PNSNSS	Coon Creek at Dowd Road	38.93126	-121.37709
Sac-Amador	Cosumnes River at Twin Cities Road	38.29098	-121.38044
Sac-Amador	Grand Island Drain near Leary Road	38.2399	-121.5649
Shasta-Tehama	Anderson Creek at Ash Creek Road	40.418	-122.2136
Solano-Yolo	Willow Slough Bypass at Pole Line	38.59015	-121.73058
Solano-Yolo	Ulatis Creek at Brown Road	38.307	-121.794
Solano Yolo	Z Drain – Dixon RCD	38.45215	-121.6752
Upper Feather	Middle Fork Feather River above Grizzly Creek	39.816	-120.426
Upper Feather	Spanish Creek below Greenhorn Creek	39.9735	-120.9103
Upper Feather	Indian Creek at Arlington Bridge	40.0846	-120.9161

The Water Board Executive Officer, Pamela Creedon, on September 12, 2008, granted the Coalition a conditional interim approval of the monitoring program for January 1 through December 31, 2009. The Coalition will be working with the Water Board staff over the next year to address outstanding issues staff have identified with the goal of obtaining long-term approval.

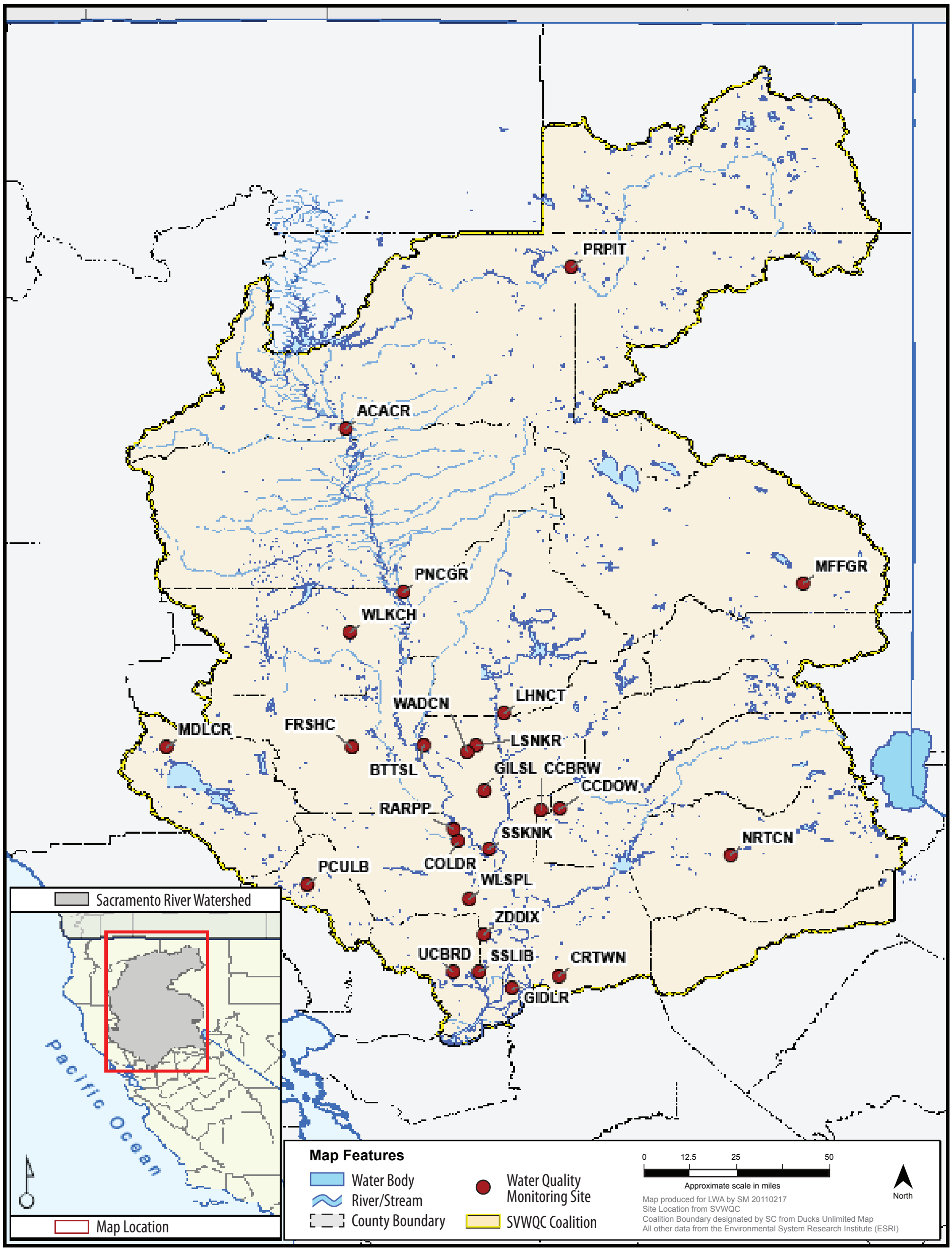


FIGURE 6-1
COALITION MONITORING SITES
2010 SACRAMENTO VALLEY REGIONAL WATER MANAGEMENT PLAN ANNUAL UPDATE

The Coalition is currently updating its Quality Assurance Project Plan, including sampling site specifics and sampling follow-up methodologies. If sampling reveals significant and persistent toxicity as defined in the MRPP or exceedances of relevant water quality objectives, then a diagnostic approach will be used to expand monitoring activities upstream to identify the general source of toxicity or cause(s) of exceedances. If the magnitude and duration of the toxicity or water quality objective exceedance is sufficient to warrant implementation of management practices, then the Coalition will mobilize its partners at the sub-watershed area level to work with growers to implement practices intended to improve water quality. The Coalition will determine the spatial distribution of crops associated with the identified constituent of concern in the affected sub-watershed area. In water bodies where water quality exceedances occur, the Coalition immediately engages the expertise of County Agricultural Commissioners and landowners to identify potential sources of the exceedance. This also triggers an aggressive process to conduct outreach and education to landowners about management practices that will improve and protect water quality. If there is a second exceedance, certain management plan obligations are triggered by the Water Board.

6.2.1 Sacramento Valley Management Plan

To address multiple exceedances of the same constituent at a given site within a 3-year period, the Coalition submitted its Management Plan (http://www.svwqc.org/) in September 2008 to the Water Board as required under the ILRP. The Coalition Management Plan elements describe a specific set of actions (source evaluation and management practices documentation) that are initiated by the Coalition and its sub-watersheds to improve water quality.

This Management Plan includes the following elements, as specified in the ILRP:

- Overall Approach
- Registered Pesticides
- Toxicity in Water and Sediment
- Pathogen Indicators
- Legacy Organochlorines Pesticides
- Trace Metals
- Salinity
- Dissolved oxygen and pH
- List of Exceedances Requiring Management Plan Development and Implementation
- Site-specific Management Plan Implementation

The Coalition's Management Plan approach includes the following elements, consistent with guidance proposed in the Monitoring Reporting Program (MRP) approved by the Water Board in January 2008 (Order No. R5-2008-0005).

1. Strategy for identification of potential sources of the observed exceedances
2. Process to identify potential additional Management Practices to be implemented to address the exceedances
3. Management Practices implementation schedule

4. Management Plan completion criteria and performance goals
5. Process and schedule for evaluating management plan effectiveness
6. Monitoring strategy and schedule
7. Identification of the participants that will implement the Management Plan
8. Schedule and process for reporting the results of Management Plan actions to Regional Water Board staff

The Coalition annually submits to the Water Board a Management Plan Progress Report (http://www.svwqc.org/), which provides an update on the status of the Coalition's progress toward completion of management plans. The management plan provides information regarding achievement of the management plan performance goals and documents the results of source identification evaluations, evaluations needed to determine the effectiveness of the management practice implementation, and whether additional or different management practices need to be implemented. The Progress Reports and Source Evaluation Reports are available for review.

Interim reporting schedules for source identification efforts will be based on the specific evaluations required. Management Plan Progress Reports will include the results of pesticide application reviews, evaluations of analytical methods, source evaluation, documentation of initial outreach meetings, documentation of any ground-level reconnaissance conducted, and recommendations for the Management Plan monitoring.

6.2.2 Diazinon Management Plan

6.2.3 Groundwater

Groundwater quality in the Sacramento Valley is generally excellent (Department Bulletin 118-2003). The Sacramento Valley is pursuing active groundwater management, which includes the protection of sustainable groundwater supplies. As the Water Board's regulatory programs evolve to include groundwater quality, the Coalition is implementing foundational actions necessary to compile and characterize existing groundwater quality data, and identify and prioritize areas to undertake special projects to improve groundwater quality and to implement a plan of action to improve groundwater quality in the region.

SECTION 7.0

Proposed Budget and Allocation of Regional Costs

Section 7.0 revisions to the RWMP are highlighted below in shaded text. SRSC's water conservation budgets were updated for 2010, 2011, 2012, and 2013.

The water conservation budget presented below (see Tables 7-1 and 7-2) for past and future years is based on estimates of staff time and materials used for conservation efforts by each of the participating SRSCs. Conservation activities were defined as actions or efforts associated with contributing to efficient water management.

TABLE 7-1
Estimated Amount Spent in 2010 and 2011
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Budget Item	Total Budget, Including Staff Time ($)	
	Year 2010	Year 2011
Conservation Staff	602,920	286,078
Measurement	861,945	897,800
CIMIS	3,260	10,102
Water Quality	152,273	146,484
Agricultural Education Program	87,617	85,243
Quantity Pricing	108,435	67,222
Policy Changes	52,092	59,973
Contractors' Pumps	4,385,210	4,646,559
Irrigation System Maintenance	6,473,096	6,536,960
Facilitate Financing of On-farm Systems	672	720
Line or Pipe Canals/Install Reservoirs	341,129	81,320
Delivery Flexibility	428,926	466,650
District Spill/Tailwater System	1,988,485	2,213,255
Optimize Conjunctive Use	410,021	397,751
Automate Canal Structures	2,337,063	590,135
Customer Pump Testing	0	0
Total	***18,233,144***	***16,486,250***

TABLE 7-2
Projected Budget and Staff Time Summary for 2012 and 2013
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Budget Item	Total Budget, Including Staff Time ($)	
	Year 2012	**Year 2013**
Conservation Staff	289,155	303,015
Measurement	1,080,872	1,794,565
CIMIS	34,171	41,605
Water Quality	152,786	148,512
Agricultural Education Program	81,648	90,173
Quantity Pricing	85,173	118,145
Policy Changes	73,801	96,817
Contractors' Pumps	4,871,617	4,995,650
Irrigation System Maintenance	5,991,600	6,317,770
Facilitate Financing of On-farm Systems	768	792
Line or Pipe Canals/Install Reservoirs	61,549	62,256
Delivery Flexibility	566,020	614,112
District Spill/Tailwater System	1,144,321	1,166,235
Optimize Conjunctive Use	1,583,398	1,828,803
Automate Canal Structures	701,481	757,531
Customer Pump Testing	3,136	3,248
Total	***16,721,496***	***18,339,228***

SECTION 8.0

RWMP Coordination

Section 8.0 revisions to the RWMP are highlighted below in shaded text. Contact information was updated for all SRSC conservation coordinators.

Quarterly conference calls or meetings will be attended by the representatives listed in Table 8-1. Any issues that may not affect an individual SRSC, but may impact the region or sub-basin will be addressed at this time. A current list of conservation coordinators for each participating SRSC will be provided with the RWMP annual update.

TABLE 8-1
RWMP Conservation Coordinators
2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

District/Company	Conservation Coordinator	Phone	Email
ACID	Stan Wangberg	530-365-7329	acidstan@sbcglobal.net
GCID	Thad Bettner	530-934-8881	tbettner@gcid.net
PID	Lance Boyd	530-934-4801	lboyd52@aol.com
PCGID	Lance Boyd	530-439-2248	lboyd52@aol.com
RD 108	Lewis Bair	530-437-2221	LBair@rd108.org
RD 1004	Kelly Boyd	530-458-7459	rd1004@comcast.net
MFWC	Andy Duffey	530-696-2456	aduffey@succeed.net
SMWC	Max Sakato	916-765-0187	xminusmax@yahoo.com
NCMWC	Dee Swearingen	916-419-5936	DSwearingen@natomaswater.com
RWMP Coordinator	Thad Bettner	530-934-8881	tbettner@gcid.net

SECTION 9.0

References

No changes were made.

Appendix A
Final Sacramento Valley Regional Water Management Plan Compact Disc

Appendix B
2009 Sacramento Valley Regional Water Management Plan Annual Update Compact Disc

Appendix C
2010 Sacramento River Settlement Contractor Water Balance Tables

APPENDIX C

2010 Sacramento River Settlement Contractor Water Balance Tables

Water balance tables for 2010 are presented for the following districts:

- Anderson-Cottonwood Irrigation District
- Glenn-Colusa Irrigation District
- Provident Irrigation District
- Princeton-Codora-Glenn Irrigation District
- Reclamation District No. 108
- Reclamation District No. 1004
- Meridian Farms Water Company
- Sutter Mutual Water Company
- Natomas Central Mutual Water Company

Anderson-Cottonwood Irrigation District (2010)

TABLE 1

Anderson-Cottonwood Irrigation District – 2010 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	6,299	-			6,299
May	17,614	-			17,614
June	16,645	-			16,645
July	17,919	-			17,919
August	18,682	-			18,682
September	16,813	-			16,813
October	6,037	-			6,037
TOTAL	100,009	-	-	-	100,009

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Anderson-Cottonwood Irrigation District – 2010 Groundwater Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	-
May	0	-
June	0	-
July	0	-
August	0	-
September	0	-
October	0	-
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Anderson-Cottonwood Irrigation District – 2010 Total District Water Supply (excluding reusea) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	6,299	-	6,299
May	17,614	-	17,614
June	16,645	-	16,645
July	17,919	-	17,919
August	18,682	-	18,682
September	16,813	-	16,813
October	6,037	-	6,037
TOTAL	100,009	-	100,009

[a]In addition to the water supplies shown in Table 3, 3,151 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Anderson-Cottonwood Irrigation District – Distribution System Evaporation and Seepage Worksheet

2010	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	8.2	0.68	0.9	0.07
Feb	4.2	0.35	1.5	0.13
Mar	0.9	0.07	3.9	0.33
Apr	3.9	0.32	4.5	0.38
May	1.2	0.10	6.7	0.56
Jun	0.0	0.00	8.6	0.72
Jul	0.0	0.00	9.3	0.77
Aug	0.0	0.00	8.1	0.68
Sept	0.2	0.02	6.0	0.50
Oct	1.8	0.15	3.4	0.29
Nov	1.0	0.08	2.2	0.18
Dec	5.4	0.45	0.8	0.06
TOTAL-YR	**26.7**	**2.23**	**55.9**	**4.66**
TOTAL-Apr-Oct	**7.1**	**0.59**	**46.6**	**3.88**

[a]Precipitation is average precipitation reported for Gerber CIMIS Station.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the reference ET (ETo) reported for the Gerber CIMIS Station.

TABLE 4

Anderson-Cottonwood Irrigation District – 2010 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	177,952	30	123	72	476	24,511	(24,915)
Laterals	871,324	10	200	118	777	11,202	(11,860)
TOTAL			323	190	1,253	35,713	(36,775)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season (April-October).

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Anderson-Cottonwood Irrigation District – 2010 Crop Consumptive Use Water Needs (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	231	3.14	0.27	62	663	0.11	25
Pasture	6,205	3.45	0.27	1,675	19,732	0.03	186
Walnuts	165	3.44	0.21	35	533	0.16	26
Crop Acres	6,601			1,772	20,928		237

Total Irrig. Acres 6,601 (If this number is larger than your known total, it may be because of double cropping.)

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres.

[b]Crop ET (ETc) is calculated as average ETo for the Gerber CIMIS Station x Kc based on ITRC Typical Year ETc for Zone 14.

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Anderson-Cottonwood Irrigation District – 2010 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	100,009
Private Groundwater	Table 2	-
Inflow From Precip[b]	Estimated	233
Available Soil Moisture[c]	Estimated	1,384
	Total Water Supplies =	**101,626**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	35,713
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,063
Riparian ET[d] (Canals/Laterals)	Estimated	6,450
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,000
	Total Distribution System =	**44,225**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	20,928
Evapotranspiration of Precip - ET_{pr}	Table 5	1,772
Cultural Practices *(includes Leaching Requirement)*	Table 5	237
	Total Crop Water Needs =	**22,937**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	
Irrigation Season Rainfall Runoff[g]	Estimated	-
Rice Cultural and Ecosystem Requirement[h]	Estimated	-
Upslope Drainwater Flow Through[i]	Estimated	-
Remainder Drainwater Outflow[j]	District Records	15,000
Total District Outflow *(from District Records)* **=**		**15,000**
Subtotal Without Recirculation *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**19,463**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**3,151**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding and flow-through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Anderson-Cottonwood Irrigation District – 2010 Annual Water Quantities Delivered Under Each Right or Contract
(April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2001	121,722				121,722	3,845	4,711
2002	124,220				124,220	3,570	4,807
2003	107,752				107,752	3,394	4,170
2004	113,569				113,569	3,577	4,395
2005	102,018				102,018	3,214	3,948
2006	93,168				93,168	2,935	3,606
2007	111,903				111,903	3,525	4,331
2008	109,864				109,864	3,464	4,252
2009	106,922				106,922	3,368	4,138
2010	100,009	0	0	0	100,009	3,151	15,000
Total	1,091,147	0	0	0	1,091,147	34,043	53,357
Average	109,115	0	0	0	109,115	3,404	5,336

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information.

[d]Estimated by District; data for prior years are not available.

Glenn-Colusa Irrigation District (2010)

TABLE 1

Glenn-Colusa Irrigation District – 2010 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	18,017	-	-	13,000	31,017
May	135,137	-	-	2,500	137,637
June	137,824	-	-	2,500	140,324
July	130,000	41,824	-	2,500	174,324
August	90,000	49,193	-	1,000	140,193
September	37,355	-	-	500	37,855
October	24,019	-	-	500	24,519
TOTAL	**572,352**	**91,017**	**-**	**22,500**	**685,869**

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Glenn-Colusa Irrigation District – 2010 Groundwater Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	2,000
May	0	2,200
June	0	2,500
July	0	2,500
August	0	2,200
September	0	1,000
October	0	500
TOTAL	**0**	**12,900**

[a]Estimated by District based on observation and historical information.

TABLE 3

Glenn-Colusa Irrigation District – Total District Water Supply (excluding reuse[a]) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	31,017	0	31,017
May	137,637	0	137,637
June	140,324	0	140,324
July	174,324	0	174,324
August	140,193	0	140,193
September	37,855	0	37,855
October	24,519	0	24,519
TOTAL	**685,869**	**0**	**685,869**

[a]In addition to the water supplies shown in Table 3, 194,677 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Glenn-Colusa Irrigation District – Distribution System Evaporation and Seepage Worksheet

2010	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	6.0	0.50	0.8	0.06
Feb	2.4	0.20	1.5	0.13
Mar	1.2	0.10	3.9	0.32
Apr	2.6	0.22	4.7	0.39
May	0.6	0.05	7.0	0.58
Jun	0.0	0.00	8.9	0.75
Jul	0.0	0.00	8.8	0.74
Aug	0.0	0.00	7.8	0.65
Sept	0.1	0.01	6.0	0.50
Oct	0.8	0.07	3.6	0.30
Nov	2.0	0.17	2.4	0.20
Dec	5.1	0.43	0.8	0.07
TOTAL-YR	**20.8**	**1.73**	**56.2**	**4.68**
TOTAL-Apr-Oct	**4.1**	**0.34**	**46.8**	**3.90**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Glenn-Colusa Irrigation District – 2010 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	341,200	70	548	187	2,141	13,708	(15,661)
Pipeline	26,400	2	0	0	0	0	0
Laterals	3,495,360	12	963	329	3,759	19,258	(22,688)
Water Shed Drains	2,919,840	15	1,005	344	3,925	5,027	(8,609)
TOTAL			**2,517**	**860**	**9,825**	**37,993**	**(46,958)**

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Glenn-Colusa Irrigation District – 2010 Crop Consumptive Use Water Needs[a] (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	1,848	3.15	0.13	240	5,581	0.11	203
Almonds	6,335	3.05	0.13	824	18,498	0.18	1,140
Beans	174	0.67	0.11	19	97	0.47	82
Corn	1,673	2.06	0.09	151	3,296	0.14	234
Cotton	0	2.53	0.08	0	0	0.02	0
Cover crop	53	3.42	0.13	7	174	0.03	2
Grapes	68	2.08	0.08	5	136	0.18	12
Habitat	597	2.98	0.13	78	1,701	0.03	18
Misc. Deciduous	2	2.92	0.13	0	6	0.16	0
Oats	4	0.67	0.11	0	2	0.02	0
Olives	101	2.92	0.13	13	282	0.09	9
Onions	483	0.82	0.11	53	343	0.28	135
Pasture	3,705	3.42	0.13	482	12,189	0.03	111
Prunes	366	3.03	0.13	48	1,061	0.18	66
Rice	105,347	3.19	0.07	7,374	328,683	0.06	6,321
Rice Straw Decomp	5,000	0.50	0.02	100	2,400	0.00	0
Sudan	221	3.42	0.13	29	727	0.07	15
Sunflowers	1,261	1.66	0.11	139	1,955	0.06	76
Tomatoes	1,490	1.72	0.05	75	2,488	0.08	119
Vegetables	280	0.90	0.13	36	216	0.18	50
Vineseed	2,281	0.90	0.13	297	1,756	0.18	411
Walnuts	3,041	3.33	0.13	395	9,731	0.16	487
Wheat	539	0.67	0.11	59	302	0.03	16
Crop Acres	134,869			10,423	391,625		9,507

Total Irrig. Acres 141,612 (If this number is larger than your known total, it may be due to double cropping.)

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 130,000 to 160,000 acre-feet in 2010).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC **Typical** Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Glenn-Colusa Irrigation District – 2010 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	685,869
Private Groundwater	Table 2	12,900
Inflow From Precip[b]	Estimated	44,372
Available Soil Moisture[c]	Estimated	3,828
	Total Water Supplies =	**746,969**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	37,993
Evaporation - Precipitation (Canals/Laterals)	Table 4	8,965
Riparian ET[d] (Canals/Laterals)	Estimated	6,450
Conveyance System Filling[e] (Canals/Laterals)	Estimated	6,000
	Total Distribution System =	**59,408**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	391,625
Evapotranspiration of Precip - ET_{pr}	Table 5	10,423
Cultural Practices *(includes Leaching Requirement)*	Table 5	9,507
	Total Crop Water Needs =	**411,556**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	32,957
Irrigation Season Rainfall Runoff[g]	Estimated	35,994
Rice Cultural and Ecosystem Requirement[h]	Estimated	105,347
Upslope Drainwater Flow Through[i]	Estimated	9,000
Remainder Drainwater Outflow[j]	Calculated	46,367
Total District Outflow *(from District Records)* **=**		**229,665**
Subtotal Without Recirculation *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**46,340**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**194,677**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Glenn-Colusa Irrigation District – 2010 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow (acre-feet)
2001	640,847	36,121	0	22,500	699,468	142,746	226,808
2002	676,247	41,476	0	22,500	740,223	144,018	231,571
2003	569,277	73,593	0	22,500	665,370	134,446	219,390
2004	665,314	59,491	0	22,500	747,305	179,137	227,987
2005	581,437	77,072	0	22,500	681,009	144,819	223,045
2006	538,589	77,144	0	22,500	638,233	159,934	220,871
2007	635,209	52,485	0	22,500	710,194	185,560	219,207
2008	691,219	55,423	0	22,500	769,142	204,255	183,373
2009	636,777	49,911	0	22,500	709,188	190,980	171,743
2010	572,352	91,017	0	22,500	685,869	194,677	229,665
Total	6,207,268	613,733	0	225,000	7,046,001	1,680,572	2,153,660
Average	620,727	61,373	0	22,500	704,600	168,057	215,366

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

Provident Irrigation District (2010)

TABLE 1

Provident Irrigation District – 2010 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	2,690	-	-	2,343	5,033
May	8,609	-	-	10,568	19,177
June	8,783	-	-	11,557	20,340
July	6,586	3,500	-	15,359	25,445
August	5,079	1,000	-	16,898	22,977
September	132	-	-	12,460	12,592
October	-	-	6,727	1,349	8,076
TOTAL	31,879	4,500	6,727	70,534	113,640

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Provident Irrigation District – 2010 Groundwater Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	55	-
May	110	-
June	82	-
July	34	-
August	2	-
September	0	-
October	143	-
TOTAL	426	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Provident Irrigation District – 2010 Total District Water Supply (excluding reuse[a]) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	5,033	55	5,088
May	19,177	110	19,287
June	20,340	82	20,422
July	25,445	34	25,479
August	22,977	2	22,979
September	12,592	-	12,592
October	8,076	143	8,219
TOTAL	113,640	426	114,066

[a]In addition to the water supplies shown in Table 3, 10,233 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Provident Irrigation District – Distribution System Evaporation and Seepage Worksheet

2010	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	6.0	0.50	0.8	0.06
Feb	2.4	0.20	1.5	0.13
Mar	1.2	0.10	3.9	0.32
Apr	2.6	0.22	4.7	0.39
May	0.6	0.05	7.0	0.58
Jun	0.0	0.00	8.9	0.75
Jul	0.0	0.00	8.8	0.74
Aug	0.0	0.00	7.8	0.65
Sept	0.1	0.01	6.0	0.50
Oct	0.8	0.07	3.6	0.30
Nov	2.0	0.17	2.4	0.20
Dec	5.1	0.43	0.8	0.07
TOTAL-YR	**20.8**	**1.73**	**56.2**	**4.68**
TOTAL-Apr-Oct	**4.1**	**0.34**	**46.8**	**3.90**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Provident Irrigation District – 2010 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	65,472	35	53	18	205	1,315	(1,503)
Laterals	206,448	12	57	19	222	569	(771)
Water Shed Drains	175,276	15	60	21	236	302	(517)
TOTAL			170	58	663	2,186	(2,791)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season (April-October).

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Provident Irrigation District – 2010 Crop Consumptive Use Water Needs[a] (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Rice	15,095	3.19	0.07	1,057	47,096	0.06	906
Rice Straw Decomp	6,000	0.50	0.02	120	2,880	0.00	0
Crop Acres	21,095			1,177	49,976		906

Total Irrig. Acres 15,095 (If this number is larger than your known total, it may be because of double cropping.)

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 19,000 to 23,000 acre-feet in 2010).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Provident Irrigation District – 2010 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	114,066
Private Groundwater	Table 2	-
Inflow From Precip[b]	Estimated	5,157
Available Soil Moisture[c]	Estimated	-
	Total Water Supplies =	**119,223**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	2,186
Evaporation - Precipitation (Canals/Laterals)	Table 4	605
Riparian ET[d] (Canals/Laterals)	Estimated	100
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,136
	Total Distribution System =	**4,027**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	49,976
Evapotranspiration of Precip - ET_{pr}	Table 5	1,177
Cultural Practices *(includes Leaching Requirement)*	Table 5	906
	Total Crop Water Needs =	**52,059**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	
Irrigation Season Rainfall Runoff[g]	Estimated	5,157
Rice Cultural and Ecosystem Requirement[h]	Estimated	15,095
Upslope Drainwater Flow Through	Calculated	23,746
Remainder Drainwater Outflow[i]	Estimated	5,937
Total District Outflow *(from District Records)* **=**		**49,935**
Subtotal Without Recirculation *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**13,203**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**10,233**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Provident Irrigation District – 2010 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[c] (acre-feet)
2001	47,494	987	0		48,481		
2002	45,370	0	0		45,370		
2003	49,730	7,228	0		56,958		
2004	45,948	0	12,931		58,879		
2005	35,050	4,500	7,028		46,578		
2006	33,282	4,500	5,597		43,379		
2007	39,263	3,385	8,779		51,427		
2008	47,280	1,747	0		49,027		
2009	35,471	4,500	11,883		51,854		
2010	31,879	4,500	6,727	70,534	113,640	10,233	49,935
Total	410,767	31,347	52,945	70,534	565,593	10,233	49,935
Average	41,077	3,135	5,295	70,534	56,559	10,233	49,935

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information. Data prior to 2010 are not available.

Princeton-Codora-Glenn Irrigation District (2010)

TABLE 1

Princeton-Codora-Glenn Irrigation District – 2010 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	2,960	-		1,635	4,595
May	13,210	-		3,774	16,984
June	12,790	28		2,507	15,325
July	8,016	6,000		3,931	17,947
August	2,805	8,400		5,146	16,351
September	2,037	-		6,743	8,780
October	3,051	-		-	3,051
TOTAL	44,869	14,428	-	23,736	83,033

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Princeton-Codora-Glenn Irrigation District – 2010 Ground Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	-
May	1,080	-
June	1,080	1,500
July	1,440	2,000
August	1,440	2,000
September	720	1,500
October	360	1,176
TOTAL	6,120	8,176

[a]Estimated by District based on observation and historical information.

TABLE 3

Princeton-Codora-Glenn Irrigation District – 2010 Total District Water Supply (excluding reuse[a]) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	4,595	-	4,595
May	16,984	1,080	18,064
June	15,325	1,080	16,405
July	17,947	1,440	19,387
August	16,351	1,440	17,791
September	8,780	720	9,500
October	3,051	360	3,411
TOTAL	83,033	6,120	89,153

[a]In addition to the water supplies shown in Table 3, 5,531 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Princeton-Codora-Glenn Irrigation District – Distribution System Evaporation and Seepage Worksheet

2010	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	6.0	0.50	0.8	0.06
Feb	2.4	0.20	1.5	0.13
Mar	1.2	0.10	3.9	0.32
Apr	2.6	0.22	4.7	0.39
May	0.6	0.05	7.0	0.58
Jun	0.0	0.00	8.9	0.75
Jul	0.0	0.00	8.8	0.74
Aug	0.0	0.00	7.8	0.65
Sept	0.1	0.01	6.0	0.50
Oct	0.8	0.07	3.6	0.30
Nov	2.0	0.17	2.4	0.20
Dec	5.1	0.43	0.8	0.07
TOTAL-YR	**20.8**	**1.73**	**56.2**	**4.68**
TOTAL-Apr-Oct	**4.1**	**0.34**	**46.8**	**3.90**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Princeton-Codora-Glenn Irrigation District – 2010 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	68,640	30	47	16	185	11,818	(11,987)
Laterals	219,384	15	76	26	295	5,666	(5,935)
Water Shed Drains	113,520	15	39	13	153	1,955	(2,094)
TOTAL			162	55	632	19,439	(20,015)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Princeton-Codora-Glenn Irrigation District – 2010 Crop Consumptive Use Water Needs[a] (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	20	3.15	0.13	3	60	0.11	2
Almonds	41	3.05	0.13	5	120	0.18	7
Beans	91	0.67	0.11	10	51	0.47	43
Onions	54	0.82	0.11	6	38	0.28	15
Prunes	65	3.03	0.13	8	189	0.18	12
Rice	8,224	3.19	0.07	576	25,659	0.06	493
Rice Straw Decomp	2,224	0.50	0.02	44	1,068	0.00	0
Vineseed	34	0.90	0.13	4	26	0.18	6
Walnuts	1,044	3.33	0.13	136	3,341	0.16	167
Wheat	180	0.67	0.11	20	101	0.03	5
Crop Acres	11,977			812	30,652		750
Total Irrig. Acres	11,977	(If this number is larger than your known total, it may be because of double cropping.)					

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 10,000 to 12,500 acre-feet in 2010).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Princeton-Codora-Glenn Irrigation District – 2010 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	89,153
Private Groundwater	Table 2	8,176
Inflow From Precip[b]	Estimated	3,332
Available Soil Moisture[c]	Estimated	245
	Total Water Supplies =	**100,906**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	19,439
Evaporation - Precipitation (Canals/Laterals)	Table 4	577
Riparian ET[d] (Canals/Laterals)	Estimated	100
Conveyance System Filling[e] (Canals/Laterals)	Estimated	830
	Total Distribution System =	**20,945**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	30,652
Evapotranspiration of Precip - ET_{pr}	Table 5	812
Cultural Practices *(includes Leaching Requirement)*	Table 5	750
	Total Crop Water Needs =	**32,215**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	
Irrigation Season Rainfall Runoff[g]	Estimated	2,810
Rice Cultural and Ecosystem Requirement[h]	Estimated	8,224
Upslope Drainwater Flow Through	Estimated	13,115
Remainder Drainwater Outflow[i]	Calculated	3,279
Total District Outflow *(from District Records)* **=**		**27,428**
Subtotal Without Recirculation *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**20,318**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**5,531**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Princeton-Codora-Glenn Irrigation District – 2010 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[c] (acre-feet)
2001	48,277	6,668	0		54,945	6,524	
2002	50,335	10,127	0		60,462	7,896	
2003	46,467	11,747	0		58,214	7,731	
2004	50,181	10,991	0		61,172	9,156	
2005	44,961	15,659	0		60,620	7,088	
2006	40,671	14,600	0		55,271	4,860	
2007	50,875	14,800	0		65,675	5,276	
2008	52,810	16,398	0		69,208	5,682	
2009	50,800	13,847	0		64,647	6,078	
2010	44,869	14,428	0	23,736	83,033	5,531	27,428
Total	480,246	129,265	0	23,736	633,247	65,822	27,428
Average	48,025	12,927	0	23,736	63,325	6,582	27,428

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information. Data prior to 2010 are not available

[d]Estimated by District based on observation and historical information.

Reclamation District 108 (2010)

TABLE 1

Reclamation District 108 – 2010 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	726	-		1,374	2,100
May	30,058	-		146	30,204
June	37,462	-		302	37,764
July	31,500	9,258		632	41,390
August	16,500	10,987		501	27,988
September	6,327	-		30	6,357
October	1,559	-		-	1,559
TOTAL	124,132	20,245	-	2,984	147,361

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Reclamation District 108 – 2010 Groundwater Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	-
May	0	-
June	0	-
July	0	-
August	0	-
September	0	-
October	0	-
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Reclamation District 108 – 2010 Total District Water Supply (excluding reuse[a]) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	2,100	-	2,100
May	30,204	-	30,204
June	37,764	-	37,764
July	41,390	-	41,390
August	27,988	-	27,988
September	6,357	-	6,357
October	1,559	-	1,559
TOTAL	147,361	-	147,361

[a]In addition to the water supplies shown in Table 3, 84,430 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Reclamation District 108 – Distribution System Evaporation and Seepage Worksheet

2010	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	6.0	0.50	0.8	0.06
Feb	2.4	0.20	1.5	0.13
Mar	1.2	0.10	3.9	0.32
Apr	2.6	0.22	4.7	0.39
May	0.6	0.05	7.0	0.58
Jun	0.0	0.00	8.9	0.75
Jul	0.0	0.00	8.8	0.74
Aug	0.0	0.00	7.8	0.65
Sept	0.1	0.01	6.0	0.50
Oct	0.8	0.07	3.6	0.30
Nov	2.0	0.17	2.4	0.20
Dec	5.1	0.43	0.8	0.07
TOTAL-YR	**20.8**	**1.73**	**56.2**	**4.68**
TOTAL-Apr-Oct	**4.1**	**0.34**	**46.8**	**3.90**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Reclamation District 108 – 2010 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	528,000	24	291	99	1,136	2,909	(3,945)
Laterals	158,400	24	87	30	341	873	(1,184)
Water Shed Drains			0	0	0	0	0
TOTAL			378	129	1,476	3,782	(5,129)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Reclamation District 108 – 2010 Crop Consumptive Use Water Needs[a] (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	2,096	3.15	0.13	272	6,330	0.11	231
Barley	46	0.67	0.11	5	26	0.02	1
Beans	590	0.67	0.11	65	330	0.47	277
Buckwheat	26	0.67	0.11	3	15	0.02	1
Corn	1,399	2.06	0.09	126	2,756	0.14	196
Habitat		2.98	0.13	0	0	0.03	0
melons	477	1.25	0.01	5	591	0.04	19
Milo	26	2.06	0.09	2	51	0.02	1
Onions	32	0.82	0.11	4	23	0.28	9
Pasture	163	3.42	0.13	21	536	0.03	5
Rice	32,299	3.19	0.07	2,261	100,773	0.06	1,938
Rice Straw Decomp	4,870	0.50	0.02	97	2,338	0.00	0
Safflower	1,342	1.66	0.11	148	2,080	0.06	81
Sunflowers	856	1.66	0.11	94	1,327	0.06	51
Tomatoes	4,265	1.72	0.05	213	7,123	0.08	341
Vegetables	40	0.90	0.13	5	31	0.18	7
Vineseed	1,267	0.90	0.13	165	976	0.18	228
Walnuts	795	3.33	0.13	103	2,544	0.16	127
Wheat	1,637	0.67	0.11	180	917	0.03	49
Crop Acres	52,226			3,770	128,765		3,562

Total Irrig. Acres 51,574 (If this number is larger than your known total, it may be because of double cropping.)

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 40,000 to 48,500 acre-feet in 2010).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Reclamation District 108 – 2010 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	147,361
Private Groundwater	Table 2	-
Inflow From Precip[b]	Estimated	16,180
Available Soil Moisture[c]	Estimated	2,409
	Total Water Supplies =	**165,950**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	3,782
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,347
Riparian ET[d] (Canals/Laterals)	Estimated	1,000
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,474
	Total Distribution System =	**7,603**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	128,765
Evapotranspiration of Precip - ETpr	Table 5	3,770
Cultural Practices *(includes Leaching Requirement)*	Table 5	3,562
	Total Crop Water Needs =	**136,097**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	-
Irrigation Season Rainfall Runoff[g]	Estimated	11,035
Rice Cultural and Ecosystem Requirement[h]	Estimated	11,045
Upslope Drainwater Flow Through[i]	Estimated	-
Remainder Drainwater Outflow[j]	Calculated	-
	Total District Outflow *(from District Records)* **=**	**22,080**
	Subtotal Without Recirculation *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*	**170**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**84,430**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Reclamation District 108 – 2010 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[c] (acre-feet)
2001	142,836	0		3,773	146,609	24,098	49,852
2002	163,319	0		3,773	167,092	36,891	57,376
2003	129,115	3,144		4,147	136,406	34,663	52,906
2004	157,751	0		4,566	162,317	60,623	54,576
2005	123,889	14,231		2,263	140,383	50,086	51,970
2006	153,886	0		5,571	159,457	54,230	79,837
2007	139,071	3,779		3,773	146,623	51,488	31,472
2008	174,949	4,389		779	180,117	46,161	43,865
2009	153,995	0		2,433	156,428	50,212	35,458
2010	124,132	20,245	0	2,984	147,361	84,430	22,080
Total	1,462,943	45,788	0	34,060	1,542,791	492,882	479,392
Average	146,294	4,579	0	3,406	154,279	49,288	47,939

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

Reclamation District 1004 (2010)

TABLE 1

Reclamation District 1004 – 2010 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	1,103	-	3,463	-	4,566
May	10,289	-	4,234	-	14,523
June	11,627	-	3,838	-	15,465
July	9,347	6,000	5,422	-	20,769
August	4,468	5,250	2,351	-	12,069
September	2,546	-	1,703	-	4,249
October	8,838	-	2,462	-	11,300
TOTAL	48,218	11,250	23,473	-	82,941

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Reclamation District 1004 – 2010 Ground Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	-
May	0	-
June	0	-
July	0	-
August	0	-
September	0	-
October	0	-
TOTAL	673	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Reclamation District 1004 – 2010 Total District Water Supply (excluding reuse[a]) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	4,566	-	4,566
May	14,523	-	14,523
June	15,465	-	15,465
July	20,769	-	20,769
August	12,069	-	12,069
September	4,249	-	4,249
October	11,300	-	11,300
TOTAL	82,941	673	83,614

[a]In addition to the water supplies shown in Table 3, 12,500 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Reclamation District 1004 – Distribution System Evaporation and Seepage Worksheet

2010	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	6.0	0.50	0.8	0.06
Feb	2.4	0.20	1.5	0.13
Mar	1.2	0.10	3.9	0.32
Apr	2.6	0.22	4.7	0.39
May	0.6	0.05	7.0	0.58
Jun	0.0	0.00	8.9	0.75
Jul	0.0	0.00	8.8	0.74
Aug	0.0	0.00	7.8	0.65
Sept	0.1	0.01	6.0	0.50
Oct	0.8	0.07	3.6	0.30
Nov	2.0	0.17	2.4	0.20
Dec	5.1	0.43	0.8	0.07
TOTAL-YR	**20.8**	**1.73**	**56.2**	**4.68**
TOTAL-Apr-Oct	**4.1**	**0.34**	**46.8**	**3.90**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Reclamation District 1004 – 2010 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canals	25,872	135	80	27	312	2,000	(2,285)
Canals	28,512	51	34	11	131	838	(957)
Canals	23,232	41	22	7	84	540	(617)
Laterals	42,768	32	31	11	121	773	(883)
Laterals	63,096	22	32	11	124	797	(910)
Laterals	47,256	15	16	6	64	410	(468)
Drains	29,568	44	30	10	116	742	(847)
Drains	29,568	28	19	7	75	480	(549)
Drains	85,536	15	29	10	115	736	(841)
Drains	12,144	12	3	1	13	84	(96)
TOTAL			296	101	1,155	7,399	(8,453)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Reclamation District 1004 – 2010 Crop Consumptive Use Water Needs[a] (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	35	3.15	0.13	5	106	0.11	4
Beans	72	0.67	0.11	8	40	0.47	34
Corn	132	2.06	0.09	12	260	0.14	18
Cotton	84	2.53	0.08	7	206	0.02	2
Habitat	6,553	2.98	0.13	852	18,676	0.03	197
Rice	12,677	3.19	0.07	887	39,552	0.06	761
Rice Straw Decomp	3,000	0.50	0.02	60	1,440	0.00	0
Tomatoes	65	1.72	0.05	3	109	0.08	5
Wheat	25	0.67	0.11	3	14	0.03	1
Crop Acres	22,643			1,836	60,403		1,022

Total Irrig. Acres 19,643 (If this number is larger than your known total, it may be because of double cropping.)

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 16,000 to 19,000 acre-feet in 2010).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Reclamation District 1004 – 2010 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	83,614
Private Groundwater	Table 2	-
Inflow From Precip[b]	Estimated	6,711
Available Soil Moisture[c]	Estimated	1,115
	Total Water Supplies =	**91,440**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	7,399
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,054
Riparian ET[d] (Canals/Laterals)	Estimated	550
Conveyance System Filling[e] (Canals/Laterals)	Estimated	829
	Total Distribution System =	**9,832**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	60,403
Evapotranspiration of Precip - ET_{pr}	Table 5	1,836
Cultural Practices *(includes Leaching Requirement)*	Table 5	1,022
	Total Crop Water Needs =	**63,261**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	
Irrigation Season Rainfall Runoff[g]	Estimated	-
Rice Cultural and Ecosystem Requirement[h]	Estimated	-
Upslope Drainwater Flow Through[i]	Estimated	-
Remainder Drainwater Outflow[j]	District Records	-
Total District Outflow *(from District Records)* **=**		**-**
Subtotal Without Recirculation *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**18,346**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**12,500**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f] Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Reclamation District 1004 – 2010 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[e] (acre-feet)
2001	47,064	4,719	15,000	0	66,783	10,000	0
2002	56,400	15,000	15,000	0	86,400	13,000	0
2003	50,934	14,146	20,000	0	85,080	12,800	0
2004	56,400	8,727	20,000	0	85,127	12,800	0
2005	39,939	12,953	20,000	0	72,892	10,900	0
2006	33,584	13,497	20,000	0	67,081	10,100	0
2007	46,168	9,973	20,000	0	76,141	11,400	0
2008	47,605	9,761	20,158	0	77,524	11,600	0
2009	38,151	12,170	20,255	0	70,576	10,600	0
2010	48,218	11,250	23,473	0	82,941	12,500	0
Total	464,463	112,196	193,886	0	770,545	115,700	0
Average	46,446	11,220	19,389	0	77,055	11,570	0

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information.

[d]Estimated by District based on observation and historical information (15% of Total Supply).

[e]District operates a closed system with little or no outflow; drainwater from rice fields is recaptured and delivered for rice straw decomposition and habitat lands

Meridian Farms Water Company (2010)

TABLE 1

Meridian Farms Water Company – 2010 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	119	-	-	45	164
May	5,957	-	-	1,750	7,707
June	6,268	-	-	2,250	8,518
July	2,000	4,895	-	2,400	9,295
August	1,100	4,617	-	1,650	7,367
September	1,969	-	-	600	2,569
October	117	-	-	-	117
TOTAL	17,530	9,512	-	8,695	35,737

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Meridian Farms Water Company – 2010 Ground Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	358	-
May	654	-
June	654	-
July	654	-
August	654	-
September	358	-
October	0	-
TOTAL	3,332	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Meridian Farms Water Company – 2010 Total District Water Supply (excluding reuse[a]) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	164	358	522
May	7,707	654	8,361
June	8,518	654	9,172
July	9,295	654	9,949
August	7,367	654	8,021
September	2,569	358	2,927
October	117	-	117
TOTAL	35,737	3,332	39,069

[a]In addition to the water supplies shown in Table 3, 8,695 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Meridian Farms Water Company – Distribution System Evaporation and Seepage Worksheet

2010	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	6.0	0.50	0.8	0.06
Feb	2.4	0.20	1.5	0.13
Mar	1.2	0.10	3.9	0.32
Apr	2.6	0.22	4.7	0.39
May	0.6	0.05	7.0	0.58
Jun	0.0	0.00	8.9	0.75
Jul	0.0	0.00	8.8	0.74
Aug	0.0	0.00	7.8	0.65
Sept	0.1	0.01	6.0	0.50
Oct	0.8	0.07	3.6	0.30
Nov	2.0	0.17	2.4	0.20
Dec	5.1	0.43	0.8	0.07
TOTAL-YR	**20.8**	**1.73**	**56.2**	**4.68**
TOTAL-Apr-Oct	**4.1**	**0.34**	**46.8**	**3.90**

aPrecipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

bMonthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Meridian Farms Water Company – 2010 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	84,480	12	23	8	91	698	(781)
Pipeline	0	0	0	0	0	0	0
Laterals	100,320	12	28	9	108	829	(928)
Water Shed Drains	0	0	0	0	0	0	0
Reservoir	0	0	0	0	0	0	0
TOTAL			51	17	199	1,527	(1,709)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Meridian Farms Water Company – 2010 Crop Consumptive Use Water Needs[a] (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	318	3.15	0.13	41	960	0.11	35
Almonds		3.05	0.13	0	0	0.18	0
Beans	100	0.67	0.11	11	56	0.47	47
Chestnuts	4	3.05	0.13	1	12	0.18	1
Corn	171	2.06	0.09	15	337	0.14	24
Crop Idle	64			0	0	0.03	2
Grapes		2.08	0.08	0	0	0.18	0
Habitat		2.98	0.13	0	0	0.03	0
Misc. Deciduous		2.92	0.13	0	0	0.16	0
Onions	40	0.82	0.11	4	28	0.28	11
Pasture	3	3.42	0.13	0	10	0.03	0
Persimmons	26	3.03	0.13	3	75	0.18	5
Prunes	69	3.03	0.13	9	200	0.18	12
Rice	5,487	3.19	0.07	384	17,119	0.06	329
Rice Straw Decomp		0.50	0.02	0	0	0.00	0
Safflower	361	1.66	0.11	40	560	0.06	22
Sunflowers	518	1.66	0.11	57	803	0.06	31
Tomatoes	261	1.72	0.05	13	436	0.08	21
Vegetables	280	0.90	0.13	36	216	0.18	50
Vineseed	223	0.90	0.13	29	172	0.18	40
Walnuts	760	3.33	0.13	99	2,432	0.16	122
Wheat	777	0.67	0.11	85	435	0.03	23
Crop Acres	9,462			829	23,851		775
Total Irrig. Acres	9,462	(If this number is larger than your known total, it may be because of double cropping.)					

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 6,800 to 8,500 acre-feet in 2010).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Meridian Farms Water Company – 2010 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	39,069
Private Groundwater	Table 2	-
Inflow From Precip[b]	Estimated	3,233
Available Soil Moisture[c]	Estimated	636
	Total Water Supplies =	**42,938**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	1,527
Evaporation - Precipitation (Canals/Laterals)	Table 4	181
Riparian ET[d] (Canals/Laterals)	Estimated	
Conveyance System Filling[e] (Canals/Laterals)	Estimated	357
	Total Distribution System =	**2,066**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	23,851
Evapotranspiration of Precip - ET_{pr}	Table 5	829
Cultural Practices *(includes Leaching Requirement)*	Table 5	775
	Total Crop Water Needs =	**25,455**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	
Irrigation Season Rainfall Runoff[g]	Estimated	1,875
Rice Cultural and Ecosystem Requirement[h]	Estimated	3,624
Uplslope Drainwater Flow Through[i]	Estimated	-
Remainder Drainwater Outflow[j]	Calculated	-
Total District Outflow *(from District Records)* **=**		**5,499**
Subtotal Without Recirculation *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**9,918**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**8,695**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Meridian Farms Water Company – 2010 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2001	18,969	7,325		5,068	31,362	5,068	4,947
2002	21,418	6,791		4,641	32,850	4,641	6,651
2003	10,240	7,550		3,766	21,556	3,766	8,703
2004	22,568	7,970		7,968	38,506	7,968	11,359
2005	15,272	9,903		5,767	30,942	5,767	8,272
2006	12,398	9,224		12,565	34,187	12,565	11,138
2007	17,506	5,130		11,927	34,563	11,927	3,396
2008	19,122	8,579		6,925	34,626	6,925	3,631
2009	17,090	8,611		7,420	33,121	7,420	3,165
2010	17,530	9,512	0	8,695	35,737	8,695	5,499
Total	172,113	80,595	0	74,741	327,449	74,741	66,761
Average	17,211	8,060	0	7,474	32,745	7,474	6,676

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District as 50% of total quantity pumped under License 7160

[d]Estimated by District as 50% of total quantity pumped under License 7160

[e] Estimated by District based on observation and historical information.

Sutter Mutual Water Company (2010)

TABLE 1

Sutter Mutual Water Company – 2010 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	2,888	-			2,888
May	40,936	-			40,936
June	44,861	-			44,861
July	28,500	26,599			55,099
August	20,000	28,638			48,638
September	5,000	3,089			8,089
October	-	-			-
TOTAL	142,185	58,326	-	-	200,511

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Sutter Mutual Water Company – 2010 Ground Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	-
May	0	-
June	0	-
July	0	-
August	0	-
September	0	-
October	0	-
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Sutter Mutual Water Company – 2010 Total District Water Supply (excluding reuse[a]) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	2,888	-	2,888
May	40,936	-	40,936
June	44,861	-	44,861
July	55,099	-	55,099
August	48,638	-	48,638
September	8,089	-	8,089
October	-	-	-
TOTAL	200,511	-	200,511

[a]In addition to the water supplies shown in Table 3, 62,316 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Sutter Mutual Water Company – Distribution System Evaporation and Seepage Worksheet

2010	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	6.0	0.50	0.8	0.06
Feb	2.4	0.20	1.5	0.13
Mar	1.2	0.10	3.9	0.32
Apr	2.6	0.22	4.7	0.39
May	0.6	0.05	7.0	0.58
Jun	0.0	0.00	8.9	0.75
Jul	0.0	0.00	8.8	0.74
Aug	0.0	0.00	7.8	0.65
Sept	0.1	0.01	6.0	0.50
Oct	0.8	0.07	3.6	0.30
Nov	2.0	0.17	2.4	0.20
Dec	5.1	0.43	0.8	0.07
TOTAL-YR	**20.8**	**1.73**	**56.2**	**4.68**
TOTAL-Apr-Oct	**4.1**	**0.34**	**46.8**	**3.90**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (Eto) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Sutter Mutual Water Company – 2010 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Main Canal	39,690	90	82	28	320	2,460	(2,752)
West Canal	52,530	90	109	37	424	3,256	(3,643)
Central Canal	50,640	75	87	30	340	2,180	(2,490)
East Canal	71,970	75	124	42	484	3,098	(3,539)
Laterals	533,390	12	147	50	574	3,673	(4,197)
Sub-Laterals	146,060	8	27	9	105	268	(364)
TOTAL			575	197	2,246	14,935	(16,985)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Sutter Mutual Water Company – 2010 Crop Consumptive Use Water Needs[a] (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	1,007	3.15	0.13	131	3,041	0.11	111
Corn	2,364	2.06	0.09	213	4,657	0.14	331
Cover crop	0	3.42	0.13	0	0	0.03	0
Beans	2,005	0.67	0.11	221	1,123	0.47	942
Habitat	0	2.98	0.13	0	0	0.03	0
Idle	0	0.10	0.02	0	0	0.00	0
Melons	1,088	1.25	0.01	11	1,349	0.04	44
Milo	307	2.06	0.09	28	605	0.02	6
Onions	0	0.82	0.11	0	0	0.28	0
Other	0	0.82	0.11	0	0	0.28	0
Pasture	0	3.42	0.13	0	0	0.03	0
Pre-irrigation	0	3.03	0.13	0	0	0.18	0
Pumpkins	0	1.25	0.01	0	0	0.04	0
Rice	29,270	3.19	0.07	2,049	91,322	0.06	1,756
Rice Decomp.	0	0.50	0.02	0	0	0.06	0
Safflowers	386	1.66	0.11	42	598	0.06	23
Sudan	0	3.42	0.13	0	0	0.07	0
Sunflowers	3,711	1.66	0.11	408	5,752	0.06	223
Tomatoes	3,794	1.72	0.05	190	6,336	0.08	304
Vegetables	0	0.90	0.13	0	0	0.18	0
Vineseed	1,258	0.90	0.13	164	969	0.18	226
Walnuts	141	3.33	0.13	18	451	0.16	23
Wheat	1,572	0.67	0.11	173	880	0.03	47
Crop Acres	46,903			3,647	117,084		4,036
Total Irrig. Acres	44,945	(If this number is larger than your known total, it may be because of double cropping.)					

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 36,500 to 44,000 acre-feet in 2010).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Sutter Mutual Water Company – 2010 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply (includes District Groundwater)	Table 3	200,511
Private Groundwater	Table 2	-
Inflow From Precip[b]	Estimated	16,025
Available Soil Moisture[c]	Estimated	2,821
	Total Water Supplies =	**219,357**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	14,935
Evaporation - Precipitation (Canals/Laterals)	Table 4	2,050
Riparian ET[d] (Canals/Laterals)	Estimated	411
Conveyance System Filling[e] (Canals/Laterals)	Estimated	2,005
	Total Distribution System =	**19,401**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	117,084
Evapotranspiration of Precip - ET_{pr}	Table 5	3,647
Cultural Practices *(includes Leaching Requirement)*	Table 5	4,036
	Total Crop Water Needs =	**124,767**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	
Irrigation Season Rainfall Runoff[g]	Estimated	10,001
Rice Cultural and Ecosystem Requirement[h]	Estimated	29,270
Upslope Drainwater Flow Through[i]	Estimated	-
Remainder Drainwater Outflow[j]	District Records	58,086
Total District Outflow *(from District Records)* **=**		**97,357**
Subtotal Without Recirculation *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**(22,168)**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**62,316**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f] Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Sutter Mutual Water Company – 2010 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2001	135,132	28,377			163,509	7,713	2,617
2002	138,105	43,390			181,495	7,349	46,320
2003	116,924	57,525			174,449	3,471	96,658
2004	162,114	66,211			228,325	29,624	
2005	136,706	54,241			190,947	12,344	
2006	143,983	73,001			216,984	24,799	
2007	167,922	56,467			224,389	38,231	
2008	169,435	30,275			199,710	45,248	
2009	153,526	35,436			188,962	57,303	
2010	142,185	58,326	0	0	200,511	62,316	97,357
Total	1,466,032	503,249	0	0	1,969,281	288,398	242,952
Average	146,603	50,325	0	0	196,928	28,840	60,738

[a]Federal Ag Water Supply from Reclamation Water Account Records. Includes Project water transferred into SMWC in 2006 and 2010.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

[d]The Department quit measuring outflow Karnak after 2003; SMWC calculated outflow for 2010.

Natomas Central Mutual Water Company (2010)

TABLE 1

Natomas Central Mutual Water Company – 2010 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[b] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	-	-	-	-	-
May	7,166	-	-		7,166
June	9,333	-	-		9,333
July	11,500	2,252	-		13,752
August	3,900	6,455	-		10,355
September	4,495	-	-		4,495
October	955	-	-		955
TOTAL	37,349	8,707	-	-	46,056

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Water from non-Company lands enters the drainage system throughout the April through October period. The quantity for 2010 is unknown at this time but is included in the quantity recycled and reused shown in Table 6.

TABLE 2

Natomas Central Mutual Water Company – 2010 Ground Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	-
May	0	-
June	57	-
July	65	-
August	0	-
September	0	-
October	0	-
TOTAL	122	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Natomas Central Mutual Water Company – 2010 Total District Water Supply (excluding reusea) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	-	-	-
May	7,166	-	7,166
June	9,333	57	9,390
July	13,752	65	13,817
August	10,355	-	10,355
September	4,495	-	4,495
October	955	-	955
TOTAL	46,056	122	46,178

[a]In addition to the water supplies shown in Table 3, 39,989 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Natomas Central Mutual Water Company – Distribution System Evaporation and Seepage Worksheet

2010	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	6.0	0.50	0.8	0.06
Feb	2.4	0.20	1.5	0.13
Mar	1.2	0.10	3.9	0.32
Apr	2.6	0.22	4.7	0.39
May	0.6	0.05	7.0	0.58
Jun	0.0	0.00	8.9	0.75
Jul	0.0	0.00	8.8	0.74
Aug	0.0	0.00	7.8	0.65
Sept	0.1	0.01	6.0	0.50
Oct	0.8	0.07	3.6	0.30
Nov	2.0	0.17	2.4	0.20
Dec	5.1	0.43	0.8	0.07
TOTAL-YR	**20.8**	**1.73**	**56.2**	**4.68**
TOTAL-Apr-Oct	**4.1**	**0.34**	**46.8**	**3.90**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (Eto) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Natomas Central Mutual Water Company – 2010 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Bennet System	44,700	56	58	20	226	0	(206)
Northern System	146,400	54	180	62	705	0	(643)
Prichard Lake Sys	204,400	54	252	86	982	0	(896)
Elkhorn System	75,100	44	76	26	298	0	(271)
Riverside System	65,800	46	69	24	270	0	(246)
TOTAL			635	217	2,480	0	(2,263)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Natomas Central Mutual Water Company – 2010 Crop Consumptive Use Water Needsa (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	670	3.15	0.13	87	2,023	0.11	74
Carrots	10	0.67	0.11	1	6	0.02	0
Corn	543	2.06	0.09	49	1,070	0.14	76
Golf Course	160	3.38	0.13	21	520	0.03	5
Habitat		2.98	0.13	0	0	0.03	0
Hay	55	0.67	0.11	6	31	0.03	2
Kiwis	2	2.92	0.13	0	6	0.18	0
Managed Marsh	605	3.27	0.13	79	1,900	0.00	0
Melons, Squash	84	1.25	0.01	1	104	0.04	3
Misc. Deciduous	8	2.92	0.13	1	22	0.16	1
Mixed Truck	42	0.90	0.13	5	32	0.18	8
Onions	15	0.82	0.11	2	11	0.28	4
Pasture	26	3.42	0.13	3	86	0.03	1
Peppers	5	1.72	0.05	0	8	0.08	0
Rice	11,055	3.19	0.07	774	34,492	0.06	663
Rice Straw Decomp		0.50	0.02	0	0	0.00	0
Sudan		3.42	0.13	0	0	0.07	0
Sunflower	784	1.66	0.11	86	1,215	0.07	55
Tomatoes	30	1.72	0.05	2	50	0.08	2
Watermelons	15	1.25	0.01	0	19	0.04	1
Wheat	1,135	0.67	0.11	125	636	0.03	34
Crop Acres	15,244			1,242	42,229		929
Total Irrig. Acres	15,244	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 14,000 to 17,000 acre-feet in 2010).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Natomas Central Mutual Water Company – 2010 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation)[a]		
District Water Supply *(includes District Groundwater)*	Table 3	46,178
Private Groundwater	Table 2	-
Inflow From Precip[b]	Estimated	5,208
Available Soil Moisture[c]	Estimated	670
	Total Water Supplies =	**52,057**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	-
Evaporation - Precipitation (Canals/Laterals)	Table 4	2,263
Riparian ET[d] (Canals/Laterals)	Estimated	525
Conveyance System Filling[e] (Canals/Laterals)	Estimated	461
	Total Distribution System =	**3,249**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	42,229
Evapotranspiration of Precip - ET_{pr}	Table 5	1,242
Cultural Practices *(includes Leaching Requirement)*	Table 5	929
	Total Crop Water Needs =	**44,400**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	
Irrigation Season Rainfall Runoff[g]	Estimated	3,777
Rice Cultural and Ecosystem Requirement[h]	Estimated	11,055
Upslope Drainwater Flow Through[i]	Estimated	-
Remainder Drainwater Outflow[j]	Calculated	168
Total District Outflow *(from District Records)* **=**		**15,000**
Subtotal Without Recirculation *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**(10,593)**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**39,989**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow-through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Natomas Central Mutual Water Company – 2010 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2001	67,712	2,269			69,981	79,090	-
2002	78,136	9,892			88,028	29,868	-
2003	57,806	19,340			77,146	3,312	-
2004	80,229	13,476			93,705	35,443	-
2005	58,239	22,000			80,239	33,030	-
2006	51,146	21,694			72,840	21,441	-
2007	51,847	13,008			64,855	39,502	-
2008	48,297	8,919			57,216	43,359	-
2009	41,778	10,997			52,775	44,224	-
2010	37,349	8,707	0	0	46,056	39,989	15,000
Total	572,539	130,302	0	0	702,841	369,259	15,000
Average	57,254	13,030	0	0	70,284	36,926	15,000

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

[d]Outflow data prior to 2010 are not available.

2010 Crop Evapotranspiration Tables – Colusa, Butte, Sutter, and American Sub-basins

Regional Water Management Plan Update

2010 Evapotranspiration and Effective Precipitation

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Typical Year

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Growing Season ETc	Effective Precip
	Precip	6	2.4	1.2	2.6	0.6	0	0	0	0.1	0.8	2	5.1		
	Grass Reference ETo	0.695	1.4	3.54	4.24	6.38	8.13	8.05	7.11	5.41	3.29	2.14	0.72		60%
Crop Type	**ITRC Representative Crop**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(acre-feet)**	**(feet)**
Alfalfa	Alfalfa Hay and Clover				3.93	5.82	7.53	7.25	6.27	4.93	2.04			3.15	0.13
Almonds	Almonds				2.26	5.67	7.30	7.27	6.61	4.73	2.79			3.05	0.13
Barley	Grain and Grain Hay				4.68	3.36	0.00	0.00	0.00	0.00	0.00			0.67	0.11
Beans	Grain and Grain Hay				4.68	3.36	0.00	0.00	0.00	0.00	0.00			0.67	0.11
Buckwheat	Grain and Grain Hay				4.68	3.36	0.00	0.00	0.00	0.00	0.00			0.67	0.11
Chestnuts	Almonds				2.26	5.67	7.30	7.27	6.61	4.73	2.79			3.05	0.13
Corn	Corn and Grain Sorghum				1.06	2.24	7.48	8.20	5.79	0.00	0.00			2.06	0.09
Cotton	Cotton				0.76	1.49	5.02	8.51	7.78	5.21	1.54			2.53	0.08
Cover Crop	Pasture and Misc. Grasses				3.51	6.31	8.07	7.93	7.01	5.35	2.91			3.42	0.13
Golf Course														3.38	0.13
Grain	Grain and Grain Hay				4.68	3.36	0.00	0.00	0.00	0.00	0.00			0.67	0.11
Grapes	Grape Vines with 80% canopy				0.87	3.07	6.33	6.43	5.16	3.13	0.00			2.08	0.08
Habitat					3.60	5.48	7.97	7.64	4.90	3.62	2.56			2.98	0.13
Hay	Grain and Grain Hay				4.68	3.36	0.00	0.00	0.00	0.00	0.00			0.67	0.11
Idle	Idle				0.17	0.19	0.23	0.15	0.36	0.07	0.00			0.10	0.02
Kiwis														2.92	0.13
Managed Marsh														3.27	0.13
Melons	Melons, Squash, and Cucumbers				0.00	0.87	1.59	5.10	5.90	1.59	0.00			1.25	0.01
Melons, Squash	Melons, Squash, and Cucumbers				0.00	0.87	1.59	5.10	5.90	1.59	0.00			1.25	0.01
Milo	Corn and Grain Sorghum				1.06	2.24	7.48	8.20	5.79	0.00	0.00			2.06	0.09
Misc. Deciduous	Misc. Deciduous				1.74	5.17	7.33	7.33	6.60	4.58	2.26			2.92	0.13
Mixed Truck														0.90	0.13
Oats	Grain and Grain Hay				4.68	3.36	0.00	0.00	0.00	0.00	0.00			0.67	0.11
Olives	Avocado				1.74	5.17	7.33	7.33	6.60	4.58	2.26			2.92	0.13
Onions	Onions and Garlic				3.81	4.76	1.24	0.00	0.00	0.00	0.00			0.82	0.11
Pasture	Pasture and Misc. Grasses				3.51	6.31	8.07	7.93	7.01	5.35	2.91			3.42	0.13
Pecans	Almonds				2.26	5.67	7.30	7.27	6.61	4.73	2.79			3.05	0.13
Peppers	Tomatoes and Peppers				0.59	3.28	8.69	7.06	0.96	0.00	0.00			1.72	0.05
Persimmons	Apple, Pear, Cherry, Plum and Prune				1.81	5.48	7.59	7.72	6.80	4.87	2.13			3.03	0.13
Prunes	Apple, Pear, Cherry, Plum and Prune				1.81	5.48	7.59	7.72	6.80	4.87	2.13			3.03	0.13
Pumpkins	Melons, Squash, and Cucumbers				0.00	0.87	1.59	5.10	5.90	1.59	0.00			1.25	0.01
Rice	Rice				0.57	6.21	9.85	9.82	8.64	2.54	0.60			3.19	0.07
Rice Decomp					0.00	0.00	0.00	0.00	0.00	0.00	6.00			0.50	0.02
Safflower	Safflower and Sunflower				3.97	7.32	7.72	0.95	0.00	0.00	0.00			1.66	0.11
Small Vegetables	Small Vegetables				4.54	1.66	0.00	0.00	1.51	1.55	1.50			0.90	0.13
Sudan	Pasture and Misc. Grasses				3.51	6.31	8.07	7.93	7.01	5.35	2.91			3.42	0.13
Sunflower	Safflower and Sunflower				3.97	7.32	7.72	0.95	0.00	0.00	0.00			1.66	0.11

Regional Water Management Plan Update

2010 Evapotranspiration and Effective Precipitation

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Typical Year

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Growing Season ETc	Effective Precip
	Precip	6	2.4	1.2	2.6	0.6	0	0	0	0.1	0.8	2	5.1		
	Grass Reference ETo	0.695	1.4	3.54	4.24	6.38	8.13	8.05	7.11	5.41	3.29	2.14	0.72		60%
Crop Type	**ITRC Representative Crop**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(acre-feet)**	**(feet)**
Tomatoes	Tomatoes and Peppers				0.59	3.28	8.69	7.06	0.96	0.00	0.00			1.72	0.05
Vegetable	Small Vegetables				4.54	1.66	0.00	0.00	1.51	1.55	1.50			0.90	0.13
Vetch	Pasture and Misc. Grasses				3.51	6.31	8.07	7.93	7.01	5.35	2.91			3.42	0.13
Vineseed	Small Vegetables				4.54	1.66	0.00	0.00	1.51	1.55	1.50			0.90	0.13
Walnuts	Walnuts				1.36	5.02	9.10	8.79	7.74	5.26	2.72			3.33	0.13
Watermelon	Melons, Squash, and Cucumbers				0.00	0.87	1.59	5.10	5.90	1.59	0.00			1.25	0.01
Wheat	Grain and Grain Hay				4.68	3.36	0.00	0.00	0.00	0.00	0.00			0.67	0.11

Source: Kc values for all crops except cover crop, rice decomp, and refuge/habitat from *California Crop and Soil Evapotranspiration* , ITRC Report 03-001, January 2003.

Notes:

Crop ET (ETc) calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

ETo was calculated as average ETo reported by CIMIS in 2010 for the Nicholas and Davis stations.

ETc includes estimated ET from pre-irrigation per ITRC Report.

2010 precipitation is the average precipitation reported for CIMIS Stations at Nicholas, Davis, and Colusa.

Effective precipitation was estimated as 60% of rainfall greater than 0.5 inch per month occurring during the growing season.

Effective Precip was calculated as 0.60 x monthly precip over 0.5 inch during crop growing season was limited to monthly ET.

Surface Evaporation was estimated as 1.1 x Grass Reference ETo.

2010 Crop Evapotranspiration Table – Redding Sub-basin

Regional Water Management Plan Update

2010 Evapotranspiration and Effective Precipitation

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Typical Year

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Growing Season ETc	Effective Precip
	Precip	8.2	4.2	0.9	3.89	1.17	0.02	0.00	0.00	0.18	1.81	1.0	5.4		
	Grass Reference ETo	0.8	1.39	3.58	4.12	6.07	7.83	8.43	7.39	5.41	3.11	1.96	0.70		60%
Crop Type	**ITRC Representative Crop**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(acre-feet)**	**(feet)**
Alfalfa	Alfalfa Hay and Clover				3.70	5.57	7.36	7.57	6.54	4.99	1.97			3.14	0.27
Pasture	Pasture and Misc. Grasses				3.46	6.05	7.92	8.43	7.54	5.35	2.64			3.45	0.27
Walnuts	Walnuts				1.37	5.02	8.93	9.42	8.37	5.56	2.59			3.44	0.21

Source: Kc values for all crops except cover crop, rice decomp, and refuge/habitat from *California Crop and Soil Evapotranspiration* , ITRC Report 03-001, January 2003.

Notes:

Crop ET (ETc) calculated as average ETo for the Gerber CIMIS Station x Kc based on ITRC Typical Year ETc for Zone 14

ETc includes estimated ET from pre-irrigation per ITRC Report.

Eto was calculated as average ETo reported by CIMIS in 2010 for the Gerber Station.

2010 precipitation is the average precipitation reported for CIMIS Station at Gerber.

Effective precipitation was estimated as 60% of rainfall greater than 0.5 inch per month occurring during the growing season.

Surface Evaporation was estimated as 1.1 x Grass Reference ETo.

2010 Estimated Leaching Requirements

Regional Water Management Plan Update

Estimated Leaching Requirements

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Type	E_{cw} [a] 0.7	EC_e at 100% Yield	LR
Alfalfa	0.7	2.0	0.11
Almonds	0.7	1.5	0.18
Barley	0.7	8.0	0.02
Beans	0.7	1.0	0.47
Buckwheat	0.7	8.0	0.02
Chestnuts	0.7	1.5	0.18
Corn	0.7	1.7	0.14
Cotton	0.7	7.7	0.02
Cover crop	0.7	5.7	0.03
Golf Course	0.7	5.7	0.03
Grain	0.7	8.0	0.02
Grapes	0.7	1.5	0.18
Habitat	0.7	5.7	0.03
Hay	0.7	5.7	0.03
Idle	0.7		
Kiwis	0.7	1.5	0.18
Managed Marsh	0.7		
Melons	0.7	4.7	0.04
Melons, Squash	0.7	4.7	0.04
Milo	0.7	6.8	0.02
Misc. Deciduous	0.7	1.6	0.16
Mixed Truck	0.7	1.5	0.18
Oats	0.7	8.0	0.02
Olives	0.7	2.3	0.09
Onions	0.7	1.2	0.28
Pasture	0.7	5.7	0.03
Pecans	0.7	1.5	0.18
Peppers	0.7	2.5	0.08
Persimmons	0.7	1.5	0.18
Prunes	0.7	1.5	0.18
Pumpkins	0.7	4.7	0.04
Rice	0.7	3.0	0.06
Rice Straw Decomp	0.7		0.00
Safflower	0.7	3.0	0.06
Small Vegetables	0.7	1.5	0.18
Sudan	0.7	2.8	0.07
Sunflowers	0.7	3.0	0.06
Tomatoes	0.7	2.5	0.08
Vegetables	0.7	1.5	0.18
Vetch	0.7	3.0	0.06
Vineseed	0.7	1.5	0.18
Walnuts	0.7	1.6	0.16
Watermelon	0.7	4.7	0.04
Wheat	0.7	5.7	0.03

[a] Assumes Blended Water Supply EC_w.

$$LR{=}EC_{w/(}5(EC_{e)}{-}ECw)$$

FAO - Water Quality for Agriculture

Water Quality for Agriculture

by

R.S. Ayers

Soil and Water Specialist (Emeritus)

University of California

Davis, California, USA

and

D.W. Westcot

Senior Land and Water Resources Specialist

California Regional Water Quality Control Board

Sacramento, California, USA

FAO IRRIGATION AND DRAINAGE PAPER

29 Rev. 1

Reprinted 1989, 1994

Appendix D
2011 Sacramento River Settlement Contractor Water Balance Tables

APPENDIX D

2011 Sacramento River Settlement Contractor Water Balance Tables

Water balance tables for 2011 are presented for the following districts:

- Anderson-Cottonwood Irrigation District
- Glenn-Colusa Irrigation District
- Provident Irrigation District
- Princeton-Codora-Glenn Irrigation District
- Reclamation District No. 108
- Reclamation District No. 1004
- Meridian Farms Water Company
- Sutter Mutual Water Company
- Natomas Central Mutual Water Company

Anderson-Cottonwood Irrigation District (2011)

TABLE 1

Anderson-Cottonwood Irrigation District – 2011 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	5,447	-			5,447
May	17,107	-			17,107
June	14,635	-			14,635
July	16,671	-			16,671
August	17,014	-			17,014
September	16,132	-			16,132
October	2,808	-			2,808
TOTAL	89,814	-	-	-	89,814

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Anderson-Cottonwood Irrigation District – 2011 Groundwater Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	-
May	0	-
June	0	-
July	0	-
August	0	-
September	0	-
October	0	-
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Anderson-Cottonwood Irrigation District – 2011 Total District Water Supply (excluding reusea) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	5,447	-	5,447
May	17,107	-	17,107
June	14,635	-	14,635
July	16,671	-	16,671
August	17,014	-	17,014
September	16,132	-	16,132
October	2,808	-	2,808
TOTAL	89,814	-	89,814

[a]In addition to the water supplies shown in Table 3, 3,150 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Anderson-Cottonwood Irrigation District – Distribution System Evaporation and Seepage Worksheet

2011	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	1.4	0.12	1.5	0.12
Feb	2.6	0.21	2.5	0.21
Mar	5.6	0.46	2.9	0.24
Apr	0.4	0.03	5.5	0.46
May	3.1	0.26	6.9	0.58
Jun	1.2	0.10	7.9	0.66
Jul	0.0	0.00	9.0	0.75
Aug	0.0	0.00	8.1	0.68
Sept	0.0	0.00	6.3	0.53
Oct	1.7	0.14	3.5	0.29
Nov	2.8	0.23	2.0	0.16
Dec	0.1	0.01	2.4	0.20
TOTAL-YR	**18.8**	**1.57**	**58.6**	**4.89**
TOTAL-Apr-Oct	**6.4**	**0.53**	**47.3**	**3.94**

[a]Precipitation is average precipitation reported for Gerber CIMIS Station.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the reference ET (ETo) reported for the Gerber CIMIS Station.

TABLE 4

Anderson-Cottonwood Irrigation District – 2011 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	177,952	30	123	65	483	24,511	(24,929)
Laterals	871,324	10	200	107	789	11,202	(11,884)
TOTAL			323	172	1,272	35,713	(36,813)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season (April-October).

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Anderson-Cottonwood Irrigation District – 2011 Crop Consumptive Use Water Needs (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[a] (crop acres)	Crop ET[b] (AF/Ac)	Effective Precipitation[c] (AF/Ac)	Effective Precipitation[c] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	231	3.29	0.23	53	707	0.11	25
Pasture	6,205	3.52	0.23	1,427	20,414	0.03	186
Walnuts	165	3.44	0.23	38	530	0.16	26
Crop Acres	6,601			1,518	21,651		237

Total Irrig. Acres 6,601 (If this number is larger than your known total, it may be due to double cropping.)

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres.

[b]Crop ET (ETc) is calculated as average ETo for the Gerber CIMIS Station x Kc based on ITRC Typical Year ETc for Zone 14.

[c]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Anderson-Cottonwood Irrigation District – 2011 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	89,814
Private Groundwater	Table 2	-
Inflow From Precip[b]	Estimated	211
Available Soil Moisture[c]	Estimated	2,030
	Total Water Supplies =	**92,055**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	35,713
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,100
Riparian ET[d] (Canals/Laterals)	Estimated	6,450
Conveyance System Filling[e] (Canals/Laterals)	Estimated	898
	Total Distribution System =	**44,161**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	21,651
Evapotranspiration of Precip - ET_{pr}	Table 5	1,518
Cultural Practices *(includes Leaching Requirement)*	Table 5	237
	Total Crop Water Needs =	**23,406**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	
Irrigation Season Rainfall Runoff[g]	Estimated	-
Rice Cultural and Ecosystem Requirement[h]	Estimated	-
Upslope Drainwater Flow Through[i]	Estimated	-
Remainder Drainwater Outflow[j]	District Records	15,000
Total District Outflow *(from District Records)* **=**		**15,000**
Percolation from Agricultural Lands *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**9,488**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**3,150**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Anderson-Cottonwood Irrigation District – 2011 Annual Water Quantities Delivered Under Each Right or Contract
(April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2002	124,220				124,220	3,570	4,807
2003	107,752				107,752	3,394	4,170
2004	113,569				113,569	3,577	4,395
2005	102,018				102,018	3,214	3,948
2006	93,168				93,168	2,935	3,606
2007	111,903				111,903	3,525	4,331
2008	109,864				109,864	3,464	4,252
2009	106,922				106,922	3,368	4,138
2010	100,009				100,009	3,151	15,000
2011	89,814	0	0	0	89,814	3,150	15,000
Total	1,059,239	0	0	0	1,059,239	33,348	63,646
Average	105,924	0	0	0	105,924	3,335	6,365

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information.

[d]Outflow data for 2011 are estimated by District; data for prior years are not available.

Glenn-Colusa Irrigation District (2011)

TABLE 1

Glenn-Colusa Irrigation District – 2011 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	37,136	-	-	6,000	43,136
May	132,500	-	-	18,000	150,500
June	127,969	-	-	12,000	139,969
July	130,000	34,044	-	2,500	166,544
August	90,000	51,970	-	1,000	142,970
September	33,677	-	-	500	34,177
October	20,335	-	-	500	20,835
TOTAL	**571,617**	**86,014**	**-**	**40,500**	**698,131**

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Glenn-Colusa Irrigation District – 2011 Groundwater Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	**M-1**	**E-1**
April	308	435
May	526	2,443
June	520	2,476
July	1,090	2,476
August	1,080	2,509
September	1,051	2,075
October	1,090	1,119
TOTAL	**5,665**	**13,533**

[a]Estimated by District based on observation and historical information.

TABLE 3

Glenn-Colusa Irrigation District – Total District Water Supply (excluding reuse[a]) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	43,136	308	43,444
May	150,500	526	151,026
June	139,969	520	140,489
July	166,544	1,090	167,634
August	142,970	1,080	144,050
September	34,177	1,051	35,228
October	20,835	1,090	21,925
TOTAL	**698,131**	**5,665**	**703,796**

[a]In addition to the water supplies shown in Table 3, 190,994 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Glenn-Colusa Irrigation District – Distribution System Evaporation and Seepage Worksheet

2011	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	1.5	0.12	1.1	0.09
Feb	2.9	0.24	2.5	0.21
Mar	5.4	0.45	2.7	0.23
Apr	0.1	0.00	5.7	0.47
May	1.4	0.11	6.7	0.56
Jun	1.5	0.13	7.2	0.60
Jul	0.0	0.00	8.5	0.71
Aug	0.2	0.02	7.6	0.63
Sept	0.0	0.00	5.8	0.48
Oct	1.2	0.10	3.6	0.30
Nov	1.2	0.10	2.4	0.20
Dec	0.2	0.02	0.8	0.07
TOTAL-YR	**15.50**	**1.29**	**54.5**	**4.54**
TOTAL-Apr-Oct	**4.36**	**0.36**	**45.1**	**3.76**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Glenn-Colusa Irrigation District – 2011 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	341,200	70	548	199	2,060	13,708	(15,569)
Pipeline	26,400	2	0	0	0	0	0
Laterals	3,495,360	12	963	350	3,618	19,258	(22,526)
Watershed Drains	2,919,840	15	1,005	365	3,778	5,027	(8,440)
TOTAL			**2,517**	**914**	**9,456**	**37,993**	**(46,535)**

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Glenn-Colusa Irrigation District – 2011 Crop Consumptive Use Water Needs[a] (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	1,297	3.12	0.13	169	3,878	0.11	143
Almonds	6,518	2.96	0.13	847	18,446	0.18	1,173
Beans	137	0.73	0.04	5	95	0.47	64
Corn	2,197	1.94	0.10	220	4,042	0.14	308
Cotton	83	2.44	0.13	11	192	0.02	2
Cover crop	74	3.39	0.13	10	241	0.03	2
Grapes	67	2.00	0.10	7	127	0.18	12
Habitat	578	2.86	0.13	75	1,578	0.03	17
Misc. Deciduous	2	2.83	0.13	0	5	0.16	0
Oats	183	0.73	0.04	7	126	0.02	4
Olives	215	2.83	0.13	28	581	0.09	19
Onions	420	0.82	0.10	42	302	0.28	118
Pasture	3,839	3.30	0.13	499	12,170	0.03	115
Prunes	255	2.95	0.13	33	719	0.18	46
Rice	106,083	3.04	0.10	10,608	311,884	0.06	6,365
Rice Straw Decomp	2,500	0.50	0.03	75	1,175	0.00	0
Sudan	26	3.30	0.13	3	82	0.07	2
Sunflowers	1,188	1.74	0.10	119	1,948	0.06	71
Tomatoes	2,254	1.61	0.10	225	3,404	0.08	180
Vegetables	128	0.87	0.08	10	101	0.18	23
Vineseed	1,132	0.87	0.08	91	894	0.18	204
Walnuts	3,332	3.19	0.13	433	10,196	0.16	533
Wheat	1,498	0.73	0.04	60	1,034	0.03	45
Crop Acres	134,006			13,578	373,221		9,446

Total Irrig. Acres 141,612 (If this number is larger than your known total, it may be due to double cropping.)

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 132,000 to 160,000 acre-feet in 2011).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC **Typical** Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Glenn-Colusa Irrigation District – 2011 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	703,796
Private Groundwater	Table 2	13,533
Inflow From Precip[b]	Estimated	47,781
Available Soil Moisture[c]	Estimated	7,642
	Total Water Supplies =	**772,751**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	37,993
Evaporation - Precipitation (Canals/Laterals)	Table 4	8,542
Riparian ET[d] (Canals/Laterals)	Estimated	6,450
Conveyance System Filling[e] (Canals/Laterals)	Estimated	6,000
	Total Distribution System =	**58,985**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	373,221
Evapotranspiration of Precip - ET_{pr}	Table 5	13,578
Cultural Practices *(includes Leaching Requirement)*	Table 5	9,446
	Total Crop Water Needs =	**396,245**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	32,280
Irrigation Season Rainfall Runoff[g]	Estimated	38,543
Rice Cultural and Ecosystem Requirement[h]	Estimated	106,083
Upslope Drainwater Flow Through[i]	Estimated	18,000
Remainder Drainwater Outflow[j]	Calculated	61,093
Total District Outflow *(from District Records)* **=**		**255,999**
Percolation from Agricultural Lands *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**61,523**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**190,994**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to be due to the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and used by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Glenn-Colusa Irrigation District – 2011 Annual Water Quantities Delivered under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow (acre-feet)
2002	676,247	41,476	0	22,500	740,223	144,018	231,571
2003	569,277	73,593	0	22,500	665,370	134,446	219,390
2004	665,314	59,491	0	22,500	747,305	179,137	227,987
2005	581,437	77,072	0	22,500	681,009	144,819	223,045
2006	538,589	77,144	0	22,500	638,233	159,934	220,871
2007	635,209	52,485	0	22,500	710,194	185,560	219,207
2008	691,219	55,423	0	22,500	769,142	204,255	183,373
2009	636,777	49,911	0	22,500	709,188	190,980	171,743
2010	572,352	91,017	0	22,500	685,869	194,677	229,665
2011	571,617	86,014	0	40,500	698,131	190,994	255,999
Total	6,138,038	663,626	0	243,000	7,044,664	1,728,820	2,182,851
Average	613,804	66,363	0	24,300	704,466	172,882	218,285

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

Provident Irrigation District (2011)

TABLE 1

Provident Irrigation District – 2011 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	2,140			1,545	3,685
May	8,870			12,709	21,579
June	6,833			11,928	18,761
July	6,300	3,256		15,112	24,668
August	2,500	90		18,452	21,042
September	28			11,456	11,484
October			6,619	2,751	9,370
TOTAL	26,671	3,346	6,619	73,953	110,589

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Provident Irrigation District – 2011 Groundwater Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	44	-
May	89	-
June	79	-
July	55	-
August	737	-
September	0	-
October	9	-
TOTAL	1,013	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Provident Irrigation District – 2011 Total District Water Supply (excluding reuse[a]) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	3,685	44	3,729
May	21,579	89	21,668
June	18,761	79	18,840
July	24,668	55	24,723
August	21,042	737	21,779
September	11,484	-	11,484
October	9,370	9	9,379
TOTAL	110,589	1,013	111,602

[a]In addition to the water supplies shown in Table 3, 9,983 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Provident Irrigation District – Distribution System Evaporation and Seepage Worksheet

2011	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	1.5	0.12	1.1	0.09
Feb	2.9	0.24	2.5	0.21
Mar	5.4	0.45	2.7	0.23
Apr	0.1	0.00	5.7	0.47
May	1.4	0.11	6.7	0.56
Jun	1.5	0.13	7.2	0.60
Jul	0.0	0.00	8.5	0.71
Aug	0.2	0.02	7.6	0.63
Sept	0.0	0.00	5.8	0.48
Oct	1.2	0.10	3.6	0.30
Nov	1.2	0.10	2.4	0.20
Dec	0.2	0.02	0.8	0.07
TOTAL-YR	**15.5**	**1.29**	**54.5**	**4.54**
TOTAL-Apr-Oct	**4.4**	**0.36**	**45.1**	**3.76**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Provident Irrigation District – 2011 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	65,472	35	53	19	198	1,315	(1,494)
Laterals	206,448	12	57	21	214	569	(762)
Water Shed Drains	175,276	15	60	22	227	302	(507)
TOTAL			170	62	638	2,186	(2,762)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season (April-October).

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Provident Irrigation District – 2011 Crop Consumptive Use Water Needs[a] (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Rice	15,144	3.04	0.10	1,514	44,523	0.06	909
Rice Straw Decomp	9,803	0.50	0.03	294	4,607	0.00	0
Crop Acres	24,947			1,808	49,131		909
Total Irrig. Acres	15,095	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 19,000 to 23,000 acre-feet in 2011).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Provident Irrigation District – 2011 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	111,602
Private Groundwater	Table 2	-
Inflow From Precip[b]	Estimated	5,502
Available Soil Moisture[c]	Estimated	-
	Total Water Supplies =	**117,104**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	2,186
Evaporation - Precipitation (Canals/Laterals)	Table 4	576
Riparian ET[d] (Canals/Laterals)	Estimated	100
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,106
	Total Distribution System =	**3,968**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	49,131
Evapotranspiration of Precip - ET_{pr}	Table 5	1,808
Cultural Practices *(includes Leaching Requirement)*	Table 5	909
	Total Crop Water Needs =	**51,848**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	
Irrigation Season Rainfall Runoff[g]	Estimated	5,502
Rice Cultural and Ecosystem Requirement[h]	Estimated	15,144
Upslope Drainwater Flow Through	Calculated	26,189
Remainder Drainwater Outflow[i]	Estimated	6,547
Total District Outflow *(from District Records)* **=**		**53,382**
Percolation from Agricultural Lands *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**7,906**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**9,983**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Provident Irrigation District – 2011 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[c] (acre-feet)
2002	45,370	0	0		45,370		
2003	49,730	7,228	0		56,958		
2004	45,948	0	12,931		58,879		
2005	35,050	4,500	7,028		46,578		
2006	33,282	4,500	5,597		43,379		
2007	39,263	3,385	8,779		51,427		
2008	47,280	1,747	0		49,027		
2009	35,471	4,500	11,883		51,854		
2010	31,879	4,500	6,727	70,534	113,640	10,233	49,935
2011	26,671	3,346	6,619	73,953	110,589	9,983	53,382
Total	389,944	33,706	59,564	144,487	627,701	20,216	103,317
Average	38,994	3,371	5,956	72,244	62,770	10,108	51,658

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information. Data prior to 2010 are not available.

Princeton-Codora-Glenn Irrigation District (2011)

TABLE 1

Princeton-Codora-Glenn Irrigation District – 2011 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	2,281			-	2,281
May	12,675			5,269	17,944
June	9,926			4,241	14,167
July	6,740	6,000		3,803	16,543
August	2,780	6,485		5,178	14,443
September	2,455			6,743	9,198
October	1,400			955	2,355
TOTAL	38,257	12,485	-	26,189	76,931

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Princeton-Codora-Glenn Irrigation District – 2011 Ground Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	1,200	300
May	1,200	350
June	800	200
July	1,200	200
August	1,200	350
September	500	200
October	300	-
TOTAL	6,400	1,600

[a]Estimated by District based on observation and historical information.

TABLE 3

Princeton-Codora-Glenn Irrigation District – 2011 Total District Water Supply (excluding reuse[a]) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	2,281	1,200	3,481
May	17,944	1,200	19,144
June	14,167	800	14,967
July	16,543	1,200	17,743
August	14,443	1,200	15,643
September	9,198	500	9,698
October	2,355	300	2,655
TOTAL	76,931	6,400	83,331

[a]In addition to the water supplies shown in Table 3, 7,664 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Princeton-Codora-Glenn Irrigation District – Distribution System Evaporation and Seepage Worksheet

2011	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	1.5	0.12	1.1	0.09
Feb	2.9	0.24	2.5	0.21
Mar	5.4	0.45	2.7	0.23
Apr	0.1	0.00	5.7	0.47
May	1.4	0.11	6.7	0.56
Jun	1.5	0.13	7.2	0.60
Jul	0.0	0.00	8.5	0.71
Aug	0.2	0.02	7.6	0.63
Sept	0.0	0.00	5.8	0.48
Oct	1.2	0.10	3.6	0.30
Nov	1.2	0.10	2.4	0.20
Dec	0.2	0.02	0.8	0.07
TOTAL-YR	**15.5**	**1.29**	**54.5**	**4.54**
TOTAL-Apr-Oct	**4.4**	**0.36**	**45.1**	**3.76**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Princeton-Codora-Glenn Irrigation District – 2011 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	68,640	30	47	17	178	11,818	(11,979)
Laterals	219,384	15	76	27	284	5,666	(5,922)
Water Shed Drains	113,520	15	39	14	147	1,955	(2,087)
TOTAL			162	59	608	19,439	(19,988)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Princeton-Codora-Glenn Irrigation District – 2011 Crop Consumptive Use Water Needsa (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	20	3.12	0.13	3	60	0.11	2
Almonds	45	2.96	0.13	6	127	0.18	8
Beans	68	0.73	0.04	3	47	0.47	32
Corn	70	1.94	0.10	7	129	0.14	10
Cotton	60	2.44	0.13	8	139	0.02	1
Onions	33	0.82	0.10	3	24	0.28	9
Pasture	18	3.30	0.13	2	57	0.03	1
Prunes	65	2.95	0.13	8	183	0.18	12
Rice	7,493	3.04	0.10	749	22,029	0.06	450
Rice Straw Decomp	2,959	0.50	0.03	89	1,391	0.00	0
Vineseed		0.87	0.08	0	0	0.18	0
Walnuts	853	3.19	0.13	111	2,610	0.16	136
Wheat	91	0.73	0.04	4	63	0.03	3
Crop Acres	11,775			993	26,859		664
Total Irrig. Acres	11,775	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 9,500 to 11,500 acre-feet in 2011).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Princeton-Codora-Glenn Irrigation District – 2011 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	83,331
Private Groundwater	Table 2	1,600
Inflow From Precip[b]	Estimated	3,203
Available Soil Moisture[c]	Estimated	388
	Total Water Supplies =	**88,523**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	19,439
Evaporation - Precipitation (Canals/Laterals)	Table 4	550
Riparian ET[d] (Canals/Laterals)	Estimated	100
Conveyance System Filling[e] (Canals/Laterals)	Estimated	769
	Total Distribution System =	**20,857**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	26,859
Evapotranspiration of Precip - ET_{pr}	Table 5	993
Cultural Practices *(includes Leaching Requirement)*	Table 5	664
	Total Crop Water Needs =	**28,515**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	
Irrigation Season Rainfall Runoff[g]	Estimated	2,722
Rice Cultural and Ecosystem Requirement[h]	Estimated	7,493
Upslope Drainwater Flow Through	Estimated	12,996
Remainder Drainwater Outflow[i]	Calculated	3,249
Total District Outflow *(from District Records)* **=**		**26,460**
Percolation from Agricultural Lands *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**12,690**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**7,664**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs, and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Princeton-Codora-Glenn Irrigation District – 2011 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[c] (acre-feet)
2002	50,335	10,127	0		60,462	7,896	
2003	46,467	11,747	0		58,214	7,731	
2004	50,181	10,991	0		61,172	9,156	
2005	44,961	15,659	0		60,620	7,088	
2006	40,671	14,600	0		55,271	4,860	
2007	50,875	14,800	0		65,675	5,276	
2008	52,810	16,398	0		69,208	5,682	
2009	50,800	13,847	0		64,647	6,078	
2010	44,869	14,428	0	23,736	83,033	5,531	27,428
2011	38,257	12,485	0	26,189	76,931	7,664	26,460
Total	470,226	135,082	0	49,925	655,233	66,962	53,888
Average	47,023	13,508	0	24,963	65,523	6,696	26,944

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information. Data prior to 2010 are not available

[d] Estimated by District based on observation and historical information.

Reclamation District 108 (2011)

TABLE 1

Reclamation District 108 – 2011 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	21,529			-	21,529
May	35,364			-	35,364
June	29,300			403	29,703
July	31,500	4,315		481	36,296
August	16,500	10,598		481	27,579
September	9,325			50	9,375
October	275				275
TOTAL	143,793	14,913	-	1,415	160,121

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Reclamation District 108 – 2011 Groundwater Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	-
May	0	-
June	0	-
July	0	-
August	0	-
September	0	-
October	0	-
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Reclamation District 108 – 2011 Total District Water Supply (excluding reuse[a]) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	21,529	-	21,529
May	35,364	-	35,364
June	29,703	-	29,703
July	36,296	-	36,296
August	27,579	-	27,579
September	9,375	-	9,375
October	275	-	275
TOTAL	160,121	-	160,121

[a]In addition to the water supplies shown in Table 3, 51,819 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Reclamation District 108 – Distribution System Evaporation and Seepage Worksheet

2011	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	1.5	0.12	1.1	0.09
Feb	2.9	0.24	2.5	0.21
Mar	5.4	0.45	2.7	0.23
Apr	0.1	0.00	5.7	0.47
May	1.4	0.11	6.7	0.56
Jun	1.5	0.13	7.2	0.60
Jul	0.0	0.00	8.5	0.71
Aug	0.2	0.02	7.6	0.63
Sept	0.0	0.00	5.8	0.48
Oct	1.2	0.10	3.6	0.30
Nov	1.2	0.10	2.4	0.20
Dec	0.2	0.02	0.8	0.07
TOTAL-YR	**15.5**	**1.29**	**54.5**	**4.54**
TOTAL-Apr-Oct	**4.4**	**0.36**	**45.1**	**3.76**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Reclamation District 108 – 2011 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	528,000	24	291	106	1,093	2,909	(3,896)
Laterals	158,400	24	87	32	328	873	(1,169)
Water Shed Drains			0	0	0	0	0
TOTAL			378	137	1,421	3,782	(5,065)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season.

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Reclamation District 108 – 2011 Crop Consumptive Use Water Needs[a] (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	1,716	3.12	0.13	223	5,131	0.11	189
Barley	66	0.73	0.04	3	46	0.02	1
Beans	218	0.73	0.04	9	150	0.47	102
Buckwheat		0.73	0.04	0	0	0.02	0
Corn	1,451	1.94	0.10	145	2,670	0.14	203
Habitat		2.86	0.13	0	0	0.03	0
Melons	366	1.18	0.10	37	395	0.04	15
Milo		1.94	0.10	0	0	0.02	0
Onions		0.82	0.10	0	0	0.28	0
Pasture	163	3.30	0.13	21	517	0.03	5
Rice	32,001	3.04	0.10	3,200	94,083	0.06	1,920
Rice Straw Decomp		0.50	0.03	0	0	0.00	0
Safflower	791	1.74	0.10	79	1,297	0.06	47
Sudan	31	3.30	0.13	4	98	0.07	2
Sunflowers	1,911	1.74	0.10	191	3,134	0.06	115
Tomatoes	3,996	1.61	0.10	400	6,034	0.08	320
Vegetables	48	0.87	0.08	4	38	0.18	9
Vineseed	1,135	0.87	0.08	91	897	0.18	204
Walnuts	1,017	3.19	0.13	132	3,112	0.16	163
Wheat	2,519	0.73	0.04	101	1,738	0.03	76
Crop Acres	47,429			4,639	119,340		3,371

Total Irrig. Acres 51,574 (If this number is larger than your known total, it may be due to double cropping.)

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 40,000 to 48,000 acre-feet in 2011).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Reclamation District 108 – 2011 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	160,121
Private Groundwater	Table 2	-
Inflow From Precip[b]	Estimated	17,233
Available Soil Moisture[c]	Estimated	4,745
	Total Water Supplies =	**182,099**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	3,782
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,284
Riparian ET[d] (Canals/Laterals)	Estimated	1,000
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,601
	Total Distribution System =	**7,666**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	119,340
Evapotranspiration of Precip - ET_{pr}	Table 5	4,639
Cultural Practices *(includes Leaching Requirement)*	Table 5	3,371
	Total Crop Water Needs =	**127,350**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	-
Irrigation Season Rainfall Runoff[g]	Estimated	11,627
Rice Cultural and Ecosystem Requirement[h]	Estimated	32,001
Upslope Drainwater Flow Through[i]	Estimated	-
Remainder Drainwater Outflow[j]	Calculated	6,806
Total District Outflow *(from District Records)* **=**		**50,434**
Percolation from Agricultural Lands *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**(3,351)**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**51,819**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Reclamation District 108 – 2011 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[c] (acre-feet)
2002	163,319	0		3,773	167,092	36,891	57,376
2003	129,115	3,144		4,147	136,406	34,663	52,906
2004	157,751	0		4,566	162,317	60,623	54,576
2005	123,889	14,231		2,263	140,383	50,086	51,970
2006	153,886	0		5,571	159,457	54,230	79,837
2007	139,071	3,779		3,773	146,623	51,488	31,472
2008	174,949	4,389		779	180,117	46,161	43,865
2009	153,995	0		2,433	156,428	50,212	35,458
2010	124,132	20,245	0	2,984	147,361	84,430	22,080
2011	143,793	14,913	0	1,415	160,121	51,819	50,434
Total	1,463,900	60,701	0	31,703	1,556,304	520,603	479,974
Average	146,390	6,070	0	3,170	155,630	52,060	47,997

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

Reclamation District 1004 (2011)

TABLE 1

Reclamation District 1004 – 2011 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	310		207		517
May	9,257		2,893		12,150
June	8,447		4,183		12,630
July	6,100	4,909	5,272		16,281
August	3,600	5,730	4,707		14,037
September	3,200		3,296		6,496
October	4,960		2,837		7,797
TOTAL	35,874	10,639	23,395	-	69,908

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Reclamation District 1004 – 2011 Ground Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	-
May	0	-
June	0	-
July	0	-
August	0	-
September	0	-
October	0	-
TOTAL	0	2,047

[a]Estimated by District based on observation and historical information.

TABLE 3

Reclamation District 1004 – 2011 Total District Water Supply (excluding reuse[a]) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	517	-	517
May	12,150	-	12,150
June	12,630	-	12,630
July	16,281	-	16,281
August	14,037	-	14,037
September	6,496	-	6,496
October	7,797	-	7,797
TOTAL	69,908	-	69,908

[a]In addition to the water supplies shown in Table 3, 7,436 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Reclamation District 1004 – Distribution System Evaporation and Seepage Worksheet

2011	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	1.5	0.12	1.1	0.09
Feb	2.9	0.24	2.5	0.21
Mar	5.4	0.45	2.7	0.23
Apr	0.1	0.00	5.7	0.47
May	1.4	0.11	6.7	0.56
Jun	1.5	0.13	7.2	0.60
Jul	0.0	0.00	8.5	0.71
Aug	0.2	0.02	7.6	0.63
Sept	0.0	0.00	5.8	0.48
Oct	1.2	0.10	3.6	0.30
Nov	1.2	0.10	2.4	0.20
Dec	0.2	0.02	0.8	0.07
TOTAL-YR	**15.5**	**1.29**	**54.5**	**4.54**
TOTAL-Apr-Oct	**4.4**	**0.36**	**45.1**	**3.76**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Reclamation District 1004 – 2011 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canals	25,872	135	80	29	301	2,000	(2,272)
Canals	28,512	51	34	12	126	838	(952)
Canals	23,232	41	22	8	81	540	(613)
Laterals	42,768	32	31	11	116	773	(878)
Laterals	63,096	22	32	12	120	797	(905)
Laterals	47,256	15	16	6	62	410	(465)
Drains	29,568	44	30	11	111	742	(842)
Drains	29,568	28	19	7	72	480	(545)
Drains	85,536	15	29	11	111	736	(836)
Drains	12,144	12	3	1	13	84	(95)
TOTAL			296	108	1,112	7,399	(8,404)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Reclamation District 1004 – 2011 Crop Consumptive Use Water Needs[a] (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa		3.12	0.13	0	0	0.11	0
Beans	71	0.73	0.04	3	49	0.47	33
Corn	164	1.94	0.10	16	302	0.14	23
Cotton		2.44	0.13	0	0	0.02	0
Habitat	7,738	2.86	0.13	1,006	21,125	0.03	232
Pasture	35	3.30	0.13	5	111	0.03	1
Rice	12,218	3.04	0.10	1,222	35,921	0.06	733
Rice Straw Decomp	3,000	0.50	0.03	90	1,410	0.00	0
Tomatoes	111	1.61	0.10	11	168	0.08	9
Wheat	97	0.73	0.04	4	67	0.03	3
Crop Acres	23,434			2,357	59,152		1,034
Total Irrig. Acres	20,434	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 15,000 to 18,500 acre-feet in 2011).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Reclamation District 1004 – 2011 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	69,908
Private Groundwater	Table 2	2,047
Inflow From Precip[b]	Estimated	7,424
Available Soil Moisture[c]	Estimated	147
	Total Water Supplies =	**79,526**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	7,399
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,005
Riparian ET[d] (Canals/Laterals)	Estimated	550
Conveyance System Filling[e] (Canals/Laterals)	Estimated	699
	Total Distribution System =	**9,653**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	59,152
Evapotranspiration of Precip - ET_{pr}	Table 5	2,357
Cultural Practices *(includes Leaching Requirement)*	Table 5	1,034
	Total Crop Water Needs =	**62,542**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	
Irrigation Season Rainfall Runoff[g]	Estimated	-
Rice Cultural and Ecosystem Requirement[h]	Estimated	-
Upslope Drainwater Flow Through[i]	Estimated	-
Remainder Drainwater Outflow[j]	District Records	-
Total District Outflow *(from District Records)* **=**		**-**
Percolation from Agricultural Lands *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**7,331**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**7,436**

[a] Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b] Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c] Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d] Riparian ET is estimated based on observation.

[e] Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f] Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g] Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h] Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i] Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j] Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Reclamation District 1004 – 2011 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture[d] (acre-feet)	Outflow[e] (acre-feet)
2002	56,400	15,000	15,000	0	86,400	13,000	0
2003	50,934	14,146	20,000	0	85,080	12,800	0
2004	56,400	8,727	20,000	0	85,127	12,800	0
2005	39,939	12,953	20,000	0	72,892	10,900	0
2006	33,584	13,497	20,000	0	67,081	10,100	0
2007	46,168	9,973	20,000	0	76,141	11,400	0
2008	47,605	9,761	20,158	0	77,524	11,600	0
2009	38,151	12,170	20,255	0	70,576	10,600	0
2010	48,218	11,250	23,473	0	82,941	12,500	0
2011	35,874	10,639	23,395	0	69,908	7,436	0
Total	453,273	118,116	202,281	0	773,670	113,136	0
Average	45,327	11,812	20,228	0	77,367	11,314	0

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records; quantities prior to 2008 are estimated.

[c]Estimated by District based on observation and historical information.

[d]Estimated by District based on observation and historical information (15% of Total Supply).

[e]District operates a closed system with little or no outflow; drainwater from rice fields is recaptured and delivered for rice straw decomposition and habitat lands

Meridian Farms Water Company (2011)

TABLE 1

Meridian Farms Water Company – 2011 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	892	-		55	947
May	4,894	-		1,720	6,614
June	5,622	-		2,175	7,797
July	2,000	4,786		2,550	9,336
August	1,100	5,677		2,330	9,107
September	2,284	-		2,085	4,369
October	-	102		-	102
TOTAL	16,792	10,565	-	10,915	38,272

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Meridian Farms Water Company – 2011 Ground Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	358	-
May	654	-
June	654	-
July	654	-
August	654	-
September	358	-
October	0	-
TOTAL	3,332	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Meridian Farms Water Company – 2011 Total District Water Supply (excluding reuse[a]) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	947	358	1,305
May	6,614	654	7,268
June	7,797	654	8,451
July	9,336	654	9,990
August	9,107	654	9,761
September	4,369	358	4,727
October	102	-	102
TOTAL	38,272	3,332	41,604

[a]In addition to the water supplies shown in Table 3, 10,915 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Meridian Farms Water Company – Distribution System Evaporation and Seepage Worksheet

2011	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	1.5	0.12	1.1	0.09
Feb	2.9	0.24	2.5	0.21
Mar	5.4	0.45	2.7	0.23
Apr	0.1	0.00	5.7	0.47
May	1.4	0.11	6.7	0.56
Jun	1.5	0.13	7.2	0.60
Jul	0.0	0.00	8.5	0.71
Aug	0.2	0.02	7.6	0.63
Sept	0.0	0.00	5.8	0.48
Oct	1.2	0.10	3.6	0.30
Nov	1.2	0.10	2.4	0.20
Dec	0.2	0.02	0.8	0.07
TOTAL-YR	**15.5**	**1.29**	**54.5**	**4.54**
TOTAL-Apr-Oct	**4.4**	**0.36**	**45.1**	**3.76**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (ETo) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Meridian Farms Water Company – 2011 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Canal	84,480	12	23	8	87	698	(777)
Pipeline	0	0	0	0	0	0	0
Laterals	100,320	12	28	10	104	829	(923)
Water Shed Drains	0	0	0	0	0	0	0
Reservoir	0	0	0	0	0	0	0
TOTAL			51	18	191	1,527	(1,700)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Meridian Farms Water Company – 2011 Crop Consumptive Use Water Needs[a] (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	261	3.12	0.13	34	780	0.11	29
Almonds		2.96	0.13	0	0	0.18	0
Beans	121	0.73	0.04	5	83	0.47	57
Chestnuts	4	2.96	0.13	1	11	0.18	1
Corn	0	1.94	0.10	0	0	0.14	0
Crop Idle	44			0	0	0.03	1
Grapes		2.00	0.10	0	0	0.18	0
Habitat		2.86	0.13	0	0	0.03	0
Misc. Deciduous		2.83	0.13	0	0	0.16	0
Onions	60	0.82	0.10	6	43	0.28	17
Pasture	3	3.30	0.13	0	10	0.03	0
Persimmons	26	2.95	0.13	3	73	0.18	5
Prunes	69	2.95	0.13	9	195	0.18	12
Rice	5,270	3.04	0.10	527	15,494	0.06	316
Rice Straw Decomp		0.50	0.03	0	0	0.00	0
Safflower	100	1.74	0.10	10	164	0.06	6
Sunflowers	504	1.74	0.10	50	827	0.06	30
Tomatoes	722	1.61	0.10	72	1,090	0.08	58
Vegetables	280	0.87	0.08	22	221	0.18	50
Vineseed	126	0.87	0.08	10	100	0.18	23
Walnuts	806	3.19	0.13	105	2,466	0.16	129
Wheat	874	0.73	0.04	35	603	0.03	26
Crop Acres	9,270			890	22,161		760
Total Irrig. Acres	9,270	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 6,500 to 7,900 acre-feet in 2011).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Meridian Farms Water Company – 2011 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	41,604
Private Groundwater	Table 2	-
Inflow From Precip[b]	Estimated	3,368
Available Soil Moisture[c]	Estimated	1,230
	Total Water Supplies =	**46,202**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	1,527
Evaporation - Precipitation (Canals/Laterals)	Table 4	173
Riparian ET[d] (Canals/Laterals)	Estimated	
Conveyance System Filling[e] (Canals/Laterals)	Estimated	383
	Total Distribution System =	**2,083**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	22,161
Evapotranspiration of Precip - ET_{pr}	Table 5	890
Cultural Practices *(includes Leaching Requirement)*	Table 5	760
	Total Crop Water Needs =	**23,810**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	
Irrigation Season Rainfall Runoff[g]	Estimated	1,915
Rice Cultural and Ecosystem Requirement[h]	Estimated	4,835
Uplslope Drainwater Flow Through[i]	Estimated	-
Remainder Drainwater Outflow[j]	Calculated	-
Total District Outflow *(from District Records)* **=**		**6,750**
Percolation from Agricultural Lands *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**13,559**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**10,915**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Meridian Farms Water Company – 2011 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2002	21,418	6,791		4,641	32,850	4,641	6,651
2003	10,240	7,550		3,766	21,556	3,766	8,703
2004	22,568	7,970		7,968	38,506	7,968	11,359
2005	15,272	9,903		5,767	30,942	5,767	8,272
2006	12,398	9,224		12,565	34,187	12,565	11,138
2007	17,506	5,130		11,927	34,563	11,927	3,396
2008	19,122	8,579		6,925	34,626	6,925	3,631
2009	17,090	8,611		7,420	33,121	7,420	3,165
2010	17,530	9,512	0	8,695	35,737	8,695	5,499
2011	16,792	10,565	0	10,915	38,272	10,915	6,750
Total	169,936	83,835	0	80,588	334,359	80,588	68,564
Average	16,994	8,384	0	8,059	33,436	8,059	6,856

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District as 50% of total quantity pumped under License 7160

[d]Estimated by District as 50% of total quantity pumped under License 7160

[e]Estimated by District based on observation and historical information.

Sutter Mutual Water Company (2011)

TABLE 1

Sutter Mutual Water Company – 2011 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	6,633				6,633
May	38,018				38,018
June	38,237				38,237
July	28,500	25,423			53,923
August	20,000	28,700			48,700
September	5,000	3,300			8,300
October	-				-
TOTAL	136,388	57,423	-	-	193,811

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

TABLE 2

Sutter Mutual Water Company – 2011 Ground Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	-
May	0	-
June	0	-
July	0	-
August	0	-
September	0	-
October	0	-
TOTAL	0	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Sutter Mutual Water Company – 2011 Total District Water Supply (excluding reuse[a]) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	6,633	-	6,633
May	38,018	-	38,018
June	38,237	-	38,237
July	53,923	-	53,923
August	48,700	-	48,700
September	8,300	-	8,300
October	-	-	-
TOTAL	193,811	-	193,811

[a]In addition to the water supplies shown in Table 3, 55,954 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Sutter Mutual Water Company – Distribution System Evaporation and Seepage Worksheet

2011	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	1.5	0.12	1.1	0.09
Feb	2.9	0.24	2.5	0.21
Mar	5.4	0.45	2.7	0.23
Apr	0.1	0.00	5.7	0.47
May	1.4	0.11	6.7	0.56
Jun	1.5	0.13	7.2	0.60
Jul	0.0	0.00	8.5	0.71
Aug	0.2	0.02	7.6	0.63
Sept	0.0	0.00	5.8	0.48
Oct	1.2	0.10	3.6	0.30
Nov	1.2	0.10	2.4	0.20
Dec	0.2	0.02	0.8	0.07
TOTAL-YR	**15.5**	**1.29**	**54.5**	**4.54**
TOTAL-Apr-Oct	**4.4**	**0.36**	**45.1**	**3.76**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (Eto) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Sutter Mutual Water Company – 2011 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Main Canal	39,690	90	82	30	308	2,460	(2,738)
West Canal	52,530	90	109	39	408	3,256	(3,624)
Central Canal	50,640	75	87	32	328	2,180	(2,476)
East Canal	71,970	75	124	45	466	3,098	(3,518)
Laterals	533,390	12	147	53	552	3,673	(4,172)
Sub-Laterals	146,060	8	27	10	101	268	(359)
TOTAL			575	209	2,162	14,935	(16,888)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Sutter Mutual Water Company – 2011 Crop Consumptive Use Water Needsa (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	790	3.12	0.13	103	2,362	0.11	87
Corn	4,821	1.94	0.10	482	8,871	0.14	675
Cover crop		3.39	0.13	0	0	0.03	0
Beans	1,566	0.73	0.04	63	1,081	0.47	736
Habitat		2.86	0.13	0	0	0.03	0
Idle		0.14	0.02	0	0	0.00	0
Melons	530	1.18	0.10	53	572	0.04	21
Milo		1.94	0.10	0	0	0.02	0
Onions		0.82	0.10	0	0	0.28	0
Other		0.82	0.10	0	0	0.28	0
Pasture		3.30	0.13	0	0	0.03	0
Pre-irrigation		2.95	0.13	0	0	0.18	0
Pumpkins		1.18	0.10	0	0	0.04	0
Rice	29,746	3.04	0.10	2,975	87,453	0.06	1,785
Rice Decomp.	0	0.50	0.03	0	0	0.06	0
Safflowers	722	1.74	0.10	72	1,184	0.06	43
Sudan		3.30	0.13	0	0	0.07	0
Sunflowers	2,697	1.74	0.10	270	4,423	0.06	162
Tomatoes	2,871	1.61	0.10	287	4,335	0.08	230
Vegetables		0.87	0.08	0	0	0.18	0
Vineseed	986	0.87	0.08	79	779	0.18	177
Walnuts	131	3.19	0.13	17	401	0.16	21
Wheat	2,216	0.73	0.04	89	1,529	0.03	66
Crop Acres	47,076			4,489	112,990		4,003
Total Irrig. Acres	44,945	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 37,000 to 45,000 acre-feet in 2011).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Sutter Mutual Water Company – 2011 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation) [a]		
District Water Supply *(includes District Groundwater)*	Table 3	193,811
Private Groundwater	Table 2	-
Inflow From Precip[b]	Estimated	17,104
Available Soil Moisture[c]	Estimated	5,330
	Total Water Supplies =	**216,246**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	14,935
Evaporation - Precipitation (Canals/Laterals)	Table 4	1,953
Riparian ET[d] (Canals/Laterals)	Estimated	411
Conveyance System Filling[e] (Canals/Laterals)	Estimated	1,938
	Total Distribution System =	**19,237**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	112,990
Evapotranspiration of Precip - ET_{pr}	Table 5	4,489
Cultural Practices *(includes Leaching Requirement)*	Table 5	4,003
	Total Crop Water Needs =	**121,482**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	
Irrigation Season Rainfall Runoff[g]	Estimated	10,808
Rice Cultural and Ecosystem Requirement[h]	Estimated	29,746
Upslope Drainwater Flow Through[i]	Estimated	-
Remainder Drainwater Outflow[j]	Calculated	82,061
Total District Outflow *(from District Records)* **=**		**122,615**
Percolation from Agricultural Lands *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**(47,088)**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**55,954**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f] Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Sutter Mutual Water Company – 2011 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2002	138,105	43,390			181,495	7,349	46,320
2003	116,924	57,525			174,449	3,471	96,658
2004	162,114	66,211			228,325	29,624	
2005	136,706	54,241			190,947	12,344	
2006	143,983	73,001			216,984	24,799	
2007	167,922	56,467			224,389	38,231	
2008	169,435	30,275			199,710	45,248	
2009	153,526	35,436			188,962	57,303	
2010	142,185	58,326	0	0	200,511	62,316	97,357
2011	136,388	57,423	0	0	193,811	55,954	122,615
Total	1,467,288	532,295	0	0	1,999,583	336,639	362,950
Average	146,729	53,230	0	0	199,958	33,664	90,738

[a]Federal Ag Water Supply from Reclamation Water Account Records. Includes Project water transferred into SMWC in 2006 and 2010.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

[d]The Department quit measuring outflow Karnak after 2003; SMWC calculated outflow for 2010 and 2011

Natomas Central Mutual Water Company (2011)

TABLE 1

Natomas Central Mutual Water Company – 2011 Surface Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[b] (acre-feet)	Total (acre-feet)
	Base Supply (acre-feet)	Project Water (acre-feet)			
Method	M-1	M-1	M-1	E-3	
April	24	-			24
May	10,425	-			10,425
June	6,209	-			6,209
July	11,500	868			12,368
August	3,900	7,454			11,354
September	3,281	-			3,281
October	346	-			346
TOTAL	35,685	8,322	-	-	44,007

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Water from non-Company lands enters the drainage system throughout the April through October period. The quantity for 2010 is unknown at this time but is included in the quantity recycled and reused shown in Table 6.

TABLE 2

Natomas Central Mutual Water Company – 2011 Ground Water Supply (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	District Groundwater (acre-feet)	Private Groundwater[a] (acre-feet)
Method	M-1	E-1
April	0	-
May	17	-
June	35	-
July	9	-
August	9	-
September	0	-
October	0	-
TOTAL	70	0

[a]Estimated by District based on observation and historical information.

TABLE 3

Natomas Central Mutual Water Company – 2011 Total District Water Supply (excluding reusea) (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method	M-1		M-1
April	24	-	24
May	10,425	17	10,442
June	6,209	35	6,244
July	12,368	9	12,377
August	11,354	9	11,363
September	3,281	-	3,281
October	346	-	346
TOTAL	44,007	70	44,077

[a]In addition to the water supplies shown in Table 3, 59,923 acre-feet were recirculated by the District for reuse within its boundaries. This recirculation and reuse is an integral component of the District's total water supply.

Natomas Central Mutual Water Company – Distribution System Evaporation and Seepage Worksheet

2011	Precipitation[a]		Evaporation[b]	
	inches	feet	inches	feet
Jan	1.5	0.12	1.1	0.09
Feb	2.9	0.24	2.5	0.21
Mar	5.4	0.45	2.7	0.23
Apr	0.1	0.00	5.7	0.47
May	1.4	0.11	6.7	0.56
Jun	1.5	0.13	7.2	0.60
Jul	0.0	0.00	8.5	0.71
Aug	0.2	0.02	7.6	0.63
Sept	0.0	0.00	5.8	0.48
Oct	1.2	0.10	3.6	0.30
Nov	1.2	0.10	2.4	0.20
Dec	0.2	0.02	0.8	0.07
TOTAL-YR	**15.5**	**1.29**	**54.5**	**4.54**
TOTAL-Apr-Oct	**4.4**	**0.36**	**45.1**	**3.76**

[a]Precipitation is average precipitation reported for Nicholas, Davis, and Colusa CIMIS Stations.

[b]Monthly evaporation from Distribution System water surfaces is estimated as 1.1 x the average reference ET (Eto) reported for the Nicholas and Davis CIMIS Stations.

TABLE 4

Natomas Central Mutual Water Company – 2011 Distribution System Evaporation and Seepage (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Canal, Pipeline, Lateral, Reservoir	Length[a] (feet)	Width[b] (feet)	Surface Area (acres)	Precipitation[c] (acre-feet)	Evaporation[d] (acre-feet)	Seepage[e] (acre-feet)	Total (acre-feet)
Bennet System	44,700	56	58	21	217	0	(196)
Northern System	146,400	54	180	66	678	0	(613)
Prichard Lake Sys	204,400	54	252	91	945	0	(854)
Elkhorn System	75,100	44	76	28	286	0	(259)
Riverside System	65,800	46	69	25	260	0	(235)
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL			635	231	2,387	0	(2,156)

[a]From District statistics.

[b]Average width of the conveyance facilities.

[c]Estimated inflow resulting from precipitation on canals, laterals, and drains during the irrigation season

[d]Estimated evaporation from canals, laterals, and drains during the irrigation season.

[e]Estimated seepage from canals, laterals, and drains during the irrigation season.

TABLE 5

Natomas Central Mutual Water Company – 2011 Crop Consumptive Use Water Needsa (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Name	Acres[b] (crop acres)	Crop ET[c] (AF/Ac)	Effective Precipitation[d] (AF/Ac)	Effective Precipitation[d] (acre-feet)	ETAW (acre-feet)	Leaching Requirement (AF/Ac)	Leaching Requirement (acre-feet)
Alfalfa	608	3.12	0.13	79	1,818	0.11	67
Corn	432	1.94	0.10	43	795	0.14	60
Golf Course	125	3.38	0.13	16	406	0.03	4
Hay	60	0.73	0.04	2	41	0.03	2
Habitat	0	2.86	0.13	0	0	0.03	0
Kiwis	2	2.92	0.13	0	6	0.18	0
Marsh	605	3.27	0.13	79	1,900	0.00	0
Melons, Squash	142	0.00	0.00	0	0	0.04	6
Misc. Deciduous	7	2.83	0.13	1	19	0.16	1
Mixed Truck	12	0.90	0.13	2	9	0.18	2
Onions	9	0.82	0.10	1	6	0.28	3
Pasture	21	3.30	0.13	3	67	0.03	1
Peppers	5	0.00	0.00	0	0	0.08	0
Rice	11,443	3.04	0.10	1,144	33,642	0.06	687
Rice Straw Decomp	0	0.50	0.03	0	0	0.00	0
Safflower	0	1.74	0.10	0	0	0.06	0
Sunflower	533	1.74	0.10	53	874	0.07	37
Tomatoes	20	1.61	0.10	2	30	0.08	2
Wheat	475	0.73	0.04	19	328	0.03	14
Crop Acres	14,499			1,445	39,941		886
Total Irrig. Acres	14,499	(If this number is larger than your known total, it may be due to double cropping.)					

[a]Crop Consumptive Use Water Needs do not include water required for initial flooding, reflooding, or flow through on rice acres. This quantity is estimated to be approximately 1.25 to 1.5 acre-feet per acre (approximately 14,000 to 17,000 acre-feet in 2011).

[b]Acres include lands irrigated by private wells.

[c]Crop ET (ETc) is calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

[d]Effective Precipitation is estimated as 60% of monthly precipitation greater than 0.5 inch during crop growing season. Because of the nature of flooded areas, such as rice field and flooded habitat, irrigation-season precipitation increases the volume of water in the flooded basin, but it typically flows through the field and, therefore, is assumed to be unavailable to meet the crop water needs.

TABLE 6

Natomas Central Mutual Water Company – 2011 District Water Balance (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Water Supplies (excluding recirculation)[a]		
District Water Supply *(includes District Groundwater)*	Table 3	44,077
Private Groundwater	Table 2	-
Inflow From Precip[b]	Estimated	5,268
Available Soil Moisture[c]	Estimated	940
	Total Water Supplies =	**50,285**
Distribution System Evaporation and Seepage		
Seepage (Canals/Laterals)	Table 4	-
Evaporation - Precipitation (Canals/Laterals)	Table 4	2,156
Riparian ET[d] (Canals/Laterals)	Estimated	252
Conveyance System Filling[e] (Canals/Laterals)	Estimated	440
	Total Distribution System =	**2,848**
Crop Consumptive Use Water Needs [f]		
Evapotranspiration of Applied Water - ETAW *(includes Evap from Rice Straw Decomposition)*	Table 5	39,941
Evapotranspiration of Precip - ET_{pr}	Table 5	1,445
Cultural Practices *(includes Leaching Requirement)*	Table 5	886
	Total Crop Water Needs =	**42,272**
District Outflows		
Water Supply Delivered to Other Districts or Users	District Records	
Irrigation Season Rainfall Runoff[g]	Estimated	4,158
Rice Cultural and Ecosystem Requirement[h]	Estimated	10,957
Upslope Drainwater Flow Through[i]	Estimated	-
Remainder Drainwater Outflow[j]	Calculated	168
Total District Outflow *(from District Records)* **=**		**15,115**
Subtotal Without Recirculation *(Total Supplies - Distribution System - Crop Water Needs - District Outflows)*		**(9,950)**
Internal Recirculation and Reuse (Not Included in the Water Balance)		
Total Quantity Recirculated for Reuse	District Records	**59,923**

[a]Water Supplies - Includes surface and groundwater supplies diverted or pumped into the District to meet Crop Consumptive Use Water Needs, District Operational needs and water required for cultural practice needs (e.g., flooding, reflooding, and flow through for rice cultivation). Does not include water recirculated by the District.

[b]Inflow from Precipitation is calculated as total April - October precipitation x Total Crop Acres minus Rice Straw Decomp acres.

[c]Available Soil Moisture is estimated as a 10% of Jan precip + 30% of Feb precip + 50% of Mar precip on Non-Rice and Non-Habitat acres.

[d]Riparian ET is estimated based on observation.

[e]Conveyance System Filling - Quantity estimated by the District required to initially fill conveyance canals and laterals. The conveyance systems are typically drained after October 31.

[f]Crop Consumptive Use Water Needs do not include quantities required for flood-up or flow through for rice.

[g]Irrigation Season Rainfall Runoff - Portion of District Outflow estimated to be the result of rainfall that cannot be captured or recirculated. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[h]Rice Cultural and Ecosystem Requirement - Portion of District Outflow estimated to result from the cultural requirements for rice flood-up and flow through. This water is available to downstream water users, for instream flow, and to meet Delta Outflow requirements.

[i]Upslope drainwater flow through is 50% of April, May, and June upslope water, limited by the Total District Outflow.

[j]Drainwater Outflow - Outflow from operational spills and end-of-season drainage. This water is available to (and utilized by) downstream water users, for instream flow, and to meet Delta Outflow requirements.

TABLE 7

Natomas Central Mutual Water Company – 2011 Annual Water Quantities Delivered Under Each Right or Contract (April through October Period Only)

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Year	Federal Ag Water Supply[a]		Non-Federal Ag Water Supply[b] (acre-feet)	Upslope Drainwater[c] (acre-feet)	Total (acre-feet)	District	
	Base Supply (acre-feet)	Project Water (acre-feet)				Recapture (acre-feet)	Outflow[d] (acre-feet)
2002	78,136	9,892			88,028	29,868	-
2003	57,806	19,340			77,146	3,312	-
2004	80,229	13,476			93,705	35,443	-
2005	58,239	22,000			80,239	33,030	-
2006	51,146	21,694			72,840	21,441	-
2007	51,847	13,008			64,855	39,502	-
2008	48,297	8,919			57,216	43,359	-
2009	41,778	10,997			52,775	44,224	-
2010	37,349	8,707	0	0	46,056	39,989	15,000
2011	35,685	8,322	0	0	44,007	59,923	15,115
Total	540,512	136,355	0	0	676,867	350,092	30,115
Average	54,051	13,636	0	0	67,687	35,009	15,058

[a]Federal Ag Water Supply from Reclamation Water Account Records.

[b]Non-Federal Ag Water Supply from District Records.

[c]Estimated by District based on observation and historical information.

[d]Outflow data prior to 2010 are not available.

2011 Crop Evapotranspiration Table – Colusa, Butte, Sutter, and American Sub-basins

Regional Water Management Plan Update

2011 Evapotranspiration and Effective Precipitation

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

		Apr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Growing Season ETc	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Effective Precip
	Precip	**2011**	**1.45**	**2.87**	**5.37**	**0.05**	**1.36**	**1.54**	**0**	**0.2**	**0.04**	**1.17**	**1.24**	**0.21**		**1.45**	**2.87**	**5.37**	**0.05**	**1.36**	**1.54**	**0**	**0.2**	**0.04**	**1.17**	**1.24**	**0.21**	
	Grass Reference ETo	**2011**	**0.98**	**2.24**	**2.46**	**5.16**	**6.10**	**6.59**	**7.75**	**6.90**	**5.26**	**3.23**	**2.14**	**0.72**															**60%**
Crop Type	**ITRC Representative Crop**		**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(acre-feet)**														**(feet)**
Alfalfa	Alfalfa Hay and Clover					5.91	5.61	6.16	6.87	6.52	4.82	1.50			3.12				0	0.516	0.624	0	0	0	0.402			0.13
Almonds	Almonds					3.97	5.35	5.87	7.07	6.09	4.72	2.39			2.96				0	0.516	0.624	0	0	0	0.402			0.13
Barley	Grain and Grain Hay					5.74	3.00	0.00	0.00	0.00	0.00	0.00			0.73				0	0.516	0	0	0	0	0			0.04
Beans	Grain and Grain Hay					5.74	3.00	0.00	0.00	0.00	0.00	0.00			0.73				0	0.516	0	0	0	0	0			0.04
Buckwheat	Grain and Grain Hay					5.74	3.00	0.00	0.00	0.00	0.00	0.00			0.73				0	0.516	0	0	0	0	0			0.04
Chestnuts	Almonds					3.97	5.35	5.87	7.07	6.09	4.72	2.39			2.96				0	0.516	0.624	0	0	0	0.402			0.13
Corn	Corn and Grain Sorghum					1.94	2.18	6.10	7.86	5.19	0.00	0.00			1.94				0	0.516	0.624	0	0	0	0			0.10
Cotton	Cotton					1.87	1.26	4.12	8.22	7.44	5.22	1.18			2.44				0	0.516	0.624	0	0	0	0.402			0.13
Cover Crop	Pasture and Misc. Grasses					4.45	6.19	6.86	7.89	7.21	5.36	2.74			3.39				0	0.516	0.624	0	0	0	0.402			0.13
Golf Course															3.38													0.13
Grain	Grain and Grain Hay					5.74	3.00	0.00	0.00	0.00	0.00	0.00			0.73				0	0.516	0	0	0	0	0			0.04
Grapes	Grape Vines with 80% canopy					2.09	2.95	5.18	5.85	4.96	2.98	0.00			2.00				0	0.516	0.624	0	0	0	0			0.10
Habitat						4.39	5.25	6.46	7.36	4.76	3.52	2.52			2.86				0	0.516	0.624	0	0	0	0.402			0.13
Hay	Grain and Grain Hay					5.74	3.00	0.00	0.00	0.00	0.00	0.00			0.73				0	0.516	0	0	0	0	0			0.04
Idle	Idle					1.21	0.09	0.18	0.00	0.02	0.23	0.00			0.14				0	0.09	0.18	0	0	0	0			0.02
Kiwi															2.92													0.13
Managed Marsh															3.27													0.13
Melons	Melons, Squash, and Cucumbers					0.00	0.76	1.29	4.71	5.70	1.64	0.00			1.18				0	0.516	0.624	0	0	0	0			0.10
Melons, Squash	Melons, Squash, and Cucumbers					0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00				0	0	0	0	0	0	0			0.00
Milo	Corn and Grain Sorghum					1.94	2.18	6.10	7.86	5.19	0.00	0.00			1.94				0	0.516	0.624	0	0	0	0			0.10
Misc. Deciduous	Misc. Deciduous					3.34	5.01	5.93	6.92	6.25	4.52	2.01			2.83				0	0.516	0.624	0	0	0	0.402			0.13
Mixed Truck															0.90													0.13
Oats	Grain and Grain Hay					5.74	3.00	0.00	0.00	0.00	0.00	0.00			0.73				0	0.516	0	0	0	0	0			0.04
Olives	Avocado					3.34	5.01	5.93	6.92	6.25	4.52	2.01			2.83				0	0.516	0.624	0	0	0	0.402			0.13
Onions	Onions and Garlic					4.83	4.25	0.78	0.00	0.00	0.00	0.00			0.82				0	0.516	0.624	0	0	0	0			0.10
Pasture	Pasture and Misc. Grasses					4.90	6.02	6.54	7.61	6.84	5.22	2.47			3.30				0	0.516	0.624	0	0	0	0.402			0.13
Pecans	Almonds					3.97	5.35	5.87	7.07	6.09	4.72	2.39			2.96				0	0.516	0.624	0	0	0	0.402			0.13
Peppers	Tomatoes and Peppers					0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00				0	0	0	0	0	0	0			0.00
Persimmons	Apple, Pear, Cherry, Plum and Prune					3.43	5.29	6.20	7.40	6.41	4.81	1.86			2.95				0	0.516	0.624	0	0	0	0.402			0.13
Prunes	Apple, Pear, Cherry, Plum and Prune					3.43	5.29	6.20	7.40	6.41	4.81	1.86			2.95				0	0.516	0.624	0	0	0	0.402			0.13
Pumpkins	Melons, Squash, and Cucumbers					0.00	0.76	1.29	4.71	5.70	1.64	0.00			1.18				0	0.516	0.624	0	0	0	0			0.10
Rice	Rice					1.75	6.18	7.97	9.46	8.38	2.66	0.10			3.04				0	0.516	0.624	0	0	0	0.1			0.10
Rice Decomp						0.00	0.00	0.00	0.00	0.00	0.00	6.00			0.50				0	0	0	0	0	0	0.402			0.03
Safflower	Safflower and Sunflower					5.46	6.99	7.00	1.48	0.00	0.00	0.00			1.74				0	0.516	0.624	0	0	0	0			0.10
Small Vegetables	Small Vegetables					5.62	1.57	0.00	0.00	1.11	1.51	0.64			0.87				0	0.516	0	0	0	0	0.402			0.08
Sudan	Pasture and Misc. Grasses					4.90	6.02	6.54	7.61	6.84	5.22	2.47			3.30				0	0.516	0.624	0	0	0	0.402			0.13
Sunflower	Safflower and Sunflower					5.46	6.99	7.00	1.48	0.00	0.00	0.00			1.74				0	0.516	0.624	0	0	0	0			0.10
Tomatoes	Tomatoes and Peppers					1.81	3.37	6.97	6.73	0.46	0.00	0.00			1.61				0	0.516	0.624	0	0	0	0			0.10
Vegetable	Small Vegetables					5.62	1.57	0.00	0.00	1.11	1.51	0.64			0.87				0	0.516	0	0	0	0	0.402			0.08
Vetch	Pasture and Misc. Grasses					4.90	6.02	6.54	7.61	6.84	5.22	2.47			3.30				0	0.516	0.624	0	0	0	0.402			0.13
Vineseed	Small Vegetables					5.62	1.57	0.00	0.00	1.11	1.51	0.64			0.87				0	0.516	0	0	0	0	0.402			0.08
Walnuts	Walnuts					2.79	4.97	7.26	8.40	7.43	5.19	2.20			3.19				0	0.516	0.624	0	0	0	0.402			0.13
Watermelon	Melons, Squash, and Cucumbers					0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00				0	0	0	0	0	0	0			0.00
Wheat	Grain and Grain Hay					5.74	3.00	0.00	0.00	0.00	0.00	0.00			0.73				0	0.516	0	0	0	0	0			0.04

Source: Kc values for all crops except cover crop, rice decomp, and refuge/habitat from *California Crop and Soil Evapotranspiration* , ITRC Report 03-001, January 2003.

Notes:

Crop ET (ETc) was calculated as average ETo for Davis and Nicholas CIMIS Stations x Kc based on ITRC Typical Year ETc for Zone 12.

ETo was calculated as the average ETo reported by CIMIS in 2011 for the Nicholas and Davis stations.

ETc includes estimated ET from pre-irrigation per ITRC report.

2011 precipitation is the average precipitation reported for CIMIS Stations at Nicholas, Davis, and Colusa.

Effective precipitation was estimated as 60% of rainfall occurring during the growing season.

2011 Crop Evapotranspiration Table – Redding Sub-basin

Regional Water Management Plan Update

2011 Evapotranspiration and Effective Precipitation

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Dry Year

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Growing Season ETc	Effective Precip
	Precip	**1.39**	**2.57**	**5.56**	**0.39**	**3.11**	**1.21**	**0.00**	**0.00**	**0.01**	**1.68**	**2.80**	**0.08**		
	Grass Reference ETo	**1.34**	**2.31**	**2.65**	**4.98**	**6.29**	**7.19**	**8.21**	**7.37**	**5.76**	**3.21**	**1.79**	**2.20**		**60%**
Crop Type	**ITRC Representative Crop**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(inches)**	**(acre-feet)**	**(feet)**
Alfalfa	Alfalfa Hay and Clover				5.62	5.77	6.74	7.44	6.99	5.32	1.54			3.29	0.23
Pasture	Pasture and Misc. Grasses				4.68	6.23	7.28	8.23	7.33	5.68	2.81			3.52	0.23
Walnuts	Walnuts				2.49	5.21	8.14	9.20	8.26	5.67	2.36			3.44	0.23

Source: Kc values for all crops except cover crop, rice decomp, and refuge/habitat from *California Crop and Soil Evapotranspiration* , ITRC Report 03-001, January 2003.

Notes:

Crop ET (ETc) was calculated as the average ETo for the Gerber CIMIS Station x Kc based on ITRC Dry Year ETc for Zone 14.
ETc includes estimated ET from pre-irrigation per ITRC Report.
ETo was calculated as the average ETo reported by CIMIS in 2011 for the Gerber Station.
2011 precipitation is the average precipitation reported for the CIMIS Station at Gerber.
Effective precipitation was estimated as 60% of rainfall greater than 0.5 inch per month occurring during the growing season.
Surface Evaporation was estimated as 1.1 x Grass Reference ETo.

2011 Estimated Leaching Requirements

Regional Water Management Plan Update

Estimated Leaching Requirements

2010/2011 Sacramento Valley Regional Water Management Plan Annual Update

Crop Type	E_{cw}[a] 0.7	EC_e at 100% Yield	LR
Alfalfa	0.7	2.0	0.11
Almonds	0.7	1.5	0.18
Barley	0.7	8.0	0.02
Beans	0.7	1.0	0.47
Buckwheat	0.7	8.0	0.02
Chestnuts	0.7	1.5	0.18
Corn	0.7	1.7	0.14
Cotton	0.7	7.7	0.02
Cover crop	0.7	5.7	0.03
Golf Course	0.7	5.7	0.03
Grain	0.7	8.0	0.02
Grapes	0.7	1.5	0.18
Habitat	0.7	5.7	0.03
Hay	0.7	5.7	0.03
Idle	0.7		
Kiwis	0.7	1.5	0.18
Managed Marsh	0.7		
Melons	0.7	4.7	0.04
Melons, Squash	0.7	4.7	0.04
Milo	0.7	6.8	0.02
Misc. Deciduous	0.7	1.6	0.16
Mixed Truck	0.7	1.5	0.18
Oats	0.7	8.0	0.02
Olives	0.7	2.3	0.09
Onions	0.7	1.2	0.28
Pasture	0.7	5.7	0.03
Pecans	0.7	1.5	0.18
Peppers	0.7	2.5	0.08
Persimmons	0.7	1.5	0.18
Prunes	0.7	1.5	0.18
Pumpkins	0.7	4.7	0.04
Rice	0.7	3.0	0.06
Rice Straw Decomp	0.7		0.00
Safflower	0.7	3.0	0.06
Small Vegetables	0.7	1.5	0.18
Sudan	0.7	2.8	0.07
Sunflowers	0.7	3.0	0.06
Tomatoes	0.7	2.5	0.08
Vegetables	0.7	1.5	0.18
Vetch	0.7	3.0	0.06
Vineseed	0.7	1.5	0.18
Walnuts	0.7	1.6	0.16
Watermelon	0.7	4.7	0.04
Wheat	0.7	5.7	0.03

[a]Assumes Blended Water Supply EC_w.

$$LR=EC_{w/(}5(EC_{e)}-ECw)$$

FAO - Water Quality for Agriculture

Water Quality for Agriculture

by

R.S. Ayers

Soil and Water Specialist (Emeritus)

University of California

Davis, California, USA

and

D.W. Westcot

Senior Land and Water Resources Specialist

California Regional Water Quality Control Board

Sacramento, California, USA

FAO IRRIGATION AND DRAINAGE PAPER

29 Rev. 1

Reprinted 1989, 1994